Please print or type with ELITE type *(12 characters/inch)* in the unshaded areas only.

Form Approved OMB No. 158-S79016
GSA No. 0246-EPA-OT

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

INSTRUCTIONS: If you received a preprinted label, affix it in the space at left. If any of the information on the label is incorrect, draw a line through it and supply the correct information in the appropriate section below. If the label is complete and correct, leave Items I, II, and III below blank. If you did not receive a preprinted label, complete all items. "Installation" means a single site where hazardous waste is generated, treated, stored and/or disposed of, or a transporter's principal place of business. Please refer to the INSTRUCTIONS FOR FILING NOTIFICATION before completing this form. The information requested herein is required by law *(Section 3010 of the Resource Conservation and Recovery Act).*

INSTALLATION'S EPA I.D. NO. NYD002056679

I. NAME OF INSTALLATION: POWERS CHEMCO INC

II. INSTALLATION MAILING ADDRESS: CHARLES STREET
GLEN COVE, NY 11542

III. LOCATION OF INSTALLATION: CHARLES STREET
GLEN COVE, NY 11542

DETACH

FOR OFFICIAL USE ONLY

COMMENTS: C

INSTALLATION'S EPA I.D. NUMBER	APPROVED	DATE RECEIVED (yr., mo., & day)
F NYD002056679 T/A 31 C 1		800814

I. NAME OF INSTALLATION

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX: 3

CITY OR TOWN: 4 | ST. | ZIP CODE

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER: 5

CITY OR TOWN: 6 | ST. | ZIP CODE

IV. INSTALLATION CONTACT

NAME AND TITLE *(last, first, & job title)*: 2 BIEDRY JOHN ENV AFFAIRS MGR

PHONE NO. *(area code & no.)*: 516-676-4000

V. OWNERSHIP

A. NAME OF INSTALLATION'S LEGAL OWNER: 8 POWERS CHEMCO INC

B. TYPE OF OWNERSHIP *(enter the appropriate letter into box)*

F = FEDERAL
M = NON–FEDERAL

M

VI. TYPE OF HAZARDOUS WASTE ACTIVITY *(enter "X" in the appropriate box(es))*

- [X] A. GENERATION
- [ ] B. TRANSPORTATION *(complete item VII)*
- [ ] C. TREAT/STORE/DISPOSE
- [ ] D. UNDERGROUND INJECTION

VII. MODE OF TRANSPORTATION *(transporters only – enter "X" in the appropriate box(es))*

- [ ] A. AIR
- [ ] B. RAIL
- [ ] C. HIGHWAY
- [ ] D. WATER
- [ ] E. OTHER *(specify):*

VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your installation's EPA I.D. Number in the space provided below.

- [X] A. FIRST NOTIFICATION
- [ ] B. SUBSEQUENT NOTIFICATION *(complete item C)*

C. INSTALLATION'S EPA I.D. NO.

IX. DESCRIPTION OF HAZARDOUS WASTES

Please go to the reverse of this form and provide the requested information.

CONTINUE ON REVERSE

81-12-02

RCRA GENERATOR INSPECTION FORM

COMPANY NAME: POWERS CHEMCO EPA I.D. NUMBER: NYD002056679

COMPANY ADDRESS: CHARLES STREET, GLEN COVE, NEW YORK

COMPANY CONTACT OR OFFICIAL: JOHN BIEDRY 516-676-4000

INSPECTOR'S NAME: KEN GIGLIELLO

TITLE: MANAGER, ENVIRONMENTAL AFFAIRS

BRANCH/ORGANIZATION: ESD/SURVEILLANCE + MONITORING

CHECK IF FACILITY IS ALSO A TSD FACILITY / /

DATE OF INSPECTION:

	YES	NO	DON'T KNOW
(1) Is there reason to believe that the facility has hazardous waste on site?	✓		

a. If yes, what leads you to believe it is hazardous waste? Check appropriate box:

/ / Company admits that its waste is hazardous during the inspection.

✓ Company admitted the waste is hazardous in its RCRA notification and/or Part A Permit Application.

✓ The waste material is listed in the regulations as a hazardous waste from a nonspecific source (§261.31)

/ / The waste material is listed in the regulations as a hazardous waste from a specific source (§261.32)

✓ The material or product is listed in the regulations as a discarded commercial chemical product (§261.33) METHANOL U 154

✓ EPA testing has shown characteristics of ignitability, corrosivity, reactivity or extraction procedure toxicity, or has revealed hazardous constituents (please attach analysis report)

/ / Company is unsure but there is reason to believe that waste materials are hazardous. (Explain)

	YES	NO	DON'T KNOW
b. Is there reason to believe that there are hazardous wastes on-site which the company claims are merely products or raw materials?		✓	
Please explain:			
c. Identity the hazardous wastes that are on-site, and estimate approximate quantities of each. * SEE ATTACHED SHEETS			
d. Describe the activities that result in the generation of hazardous waste. * SEE ATTACHED SHEETS			
(2) Is hazardous waste stored on site?	✓		
a. What is the longest period that it has been accumulated? Less than 90 days			
b. Is the date when drums were placed in storage marked on each drum?	✓		
(3) Has hazardous waste been shipped from this facility since November 19, 1980? YES	✓		
(4) Approximately how many hazardous waste shipments off site have been made since November 19, 1980? 25 - LOOKED AT EACH MANIFEST			
a. Does it appear from the available information that there is a manifest copy available for each hazardous waste shipment that has been made?	✓		
b. If "no" or "don't know," please elaborate.			

	YES	NO	DON'T KNOW
c. Does each manifest (or a representative sample) have the following information?			
- a manifest document number	✓		
- the generator's name, mailing address, telephone number, and EPA identification number	✓		
- the name, and EPA identification number of each transporter	✓		
- the name, address and EPA identification number of the designated facility and an alternate facility, if any:	✓		
- a description of the wastes (DOT)	✓		
- the total quantity of each hazardous waste by units of weight or volume, and the type and number of containers as loaded into or onto the transport vehicle	✓		
- a certification that the materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation under regulations of the Department of Transportation and the EPA	✓		
(5) Were there any hazardous wastes stored on site at the time of the inspection?	✓		
a. If "yes," do they appear properly packaged (if in containers) or, if in tanks, are the tanks secure?			
b. If not properly packaged or in secure tanks, please explain.			
c. Are containers clearly marked and labelled? LARGE TANKS ✓	✓		
d. Do any containers appear to be leaking?		✓	
e. If "yes," approximately how many?			

* SEE ATTACHED SHEETS

*(6) Has the generator submitted an annual report to EPA covering the previous calendar year? N/A

a. How do you know?

(7) Has the generator received signed copies (from the TSD facility) of all manifests for wastes shipped off site more than 35 days ago? ✓

a. If "no," have Exception Reports been submitted to EPA covering these shipments? N/A

(8) General comments.

RECOMMENDATIONS:

1. A WRITTEN INSPECTION LOG FOR BOTH THE TANK AND DRUM STORAGE AREAS SHOULD BE IMPLEMENTED.
2. EACH OF THE TWO STORAGE AREAS SHOULD HAVE A SIGN POSTED TO INFORM EMPLOYEES OF THESE AREAS.
3. HAZARDOUS AND NON-HAZARDOUS WASTES SHOULD BE SEGREGATED.
4. THE STORAGE AREAS SHOULD HAVE DIKES OR BERMS DUE TO PHYSICAL LOCATION OF AREAS WHICH FLOW TO A DISCHARGE POINT TO THE GLEN COVE CREEK IN THE EVENT OF A SPILL OR UNPLANNED RELEASE OF HAZARDOUS WASTE. (COMPANY MANAGER OF ENVL. AFFAIRS HAS PUT IN AN ORDER FOR WORK REQUEST TO BUILD A DIKE/BERM - JULY 1, 1981).

* The effective date for this requirement is March 1, 1982.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION:

POWERS CHEMCO, GLEN COVE, N.Y.
NYD 002056679

- 550 EMPLOYEES
- 6 DAYS/WEEK, 24 HOURS/DAY
- ANNUAL SHUTDOWN → JULY 1½ WEEKS

PRODUCTS

1. PHOTOGRAPHIC FILM (BLACK AND WHITE) FOR NEWSPAPER USE.
2. INDUSTRIAL CAMERAS (MACHINING, ASSEMBLY)
3. PHOTOGRAPHIC CHEMICALS (MIXING ONLY)

PHOTOGRAPHIC FILM PROCESS

RAW MATERIALS:

SILVER NITRATE
GELATIN
PROPRIETARY CHEMICALS

→ PHOTOGRAPHIC EMULSION → COAT ONTO A PLASTIC BASE → CUT INTO FILM

GENERATION OF HAZARDOUS WASTE: BY CODE

1. D000-A. SPENT PHOTOGRAPHIC FIXER/DEVELOPER PLACED IN BULK STORAGE - ~ 30 DRUMS/YEAR

B. DIATOMACEOUS EARTH FROM WASTE WATER TREATMENT PLANT - CADMIUM BEARING WASTE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

GENERATION OF HAZARDOUS WASTE:

2. D 001 - IGNITABLE ORGANIC SOLVENTS, METHANOL ETHANOL, PYRIDINE FROM EQUIPMENT CLEANING, R & D OPERATIONS AND USE IN FILM EMULSIONS.
VOLUME : 10 - 15 DRUMS / YEAR.

3. F001 - DEGREASING IN PHOTO MIXING OPERATION WITH 1, 1, 1 - TRICHLOROETHANE.
VOLUME : ONE DRUM / YEAR

4. F002 - SPENT HALOGENATED SOLVENTS FROM CHEMICAL MIXING OPERATION.
VOLUME : ONE DRUM / YEAR.

5. F005 - PAINT THINNERS AND/OR ORGANIC SOLVENTS ACETONE, ETHANOL.
VOLUME : 5 - 10 DRUMS / YEAR.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

TRANSPORTERS USED BY FACILITY

- SCA CHEMICAL SERVICES, NEWARK, N.J.
- RGM MANAGEMENT, DEER PARK, N.Y.
- HWD TRANSPORT, FARMINGDALE, N.Y.

TSD FACILITIES USED BY FACILITY:

- SCA CHEMICAL SERVICES, NEWARK, N.J.
- SCA CHEMICAL SERVICES, SOUTH CAROLINA
  1. DISPOSE OF DIATOMACEOUS EARTH SOLIDS
- RECYCLING INDUSTRIES, BRAINTREE, MASSACHUSETTS
  1. DISPOSE OF SOLVENTS
- CHEMICAL MANAGEMENT INC., FARMINGDALE, N.Y.
  1. DISPOSE OF PHOTOGRAPHIC FIXER AND DEVELOPER.
- MODERN TRANSPORTATION, S. KEARNY, N.J.

STORAGE AREAS

- DRUM STORAGE AREA
  1. LOCATED OUTSIDE, BEHIND BUILDING - NO COVER ON AREA.
  2. HAZARDOUS WASTE AND NON-HAZARDOUS WASTE STORED IN SAME AREA.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

- DRUM STORAGE AREA:

3. DRUMS APPEARED TO BE IN GOOD CONDITION.
4. NO SIGN ON HAZARDOUS WASTE STORAGE.
5. STEEP GRADE BELOW THE DRUMS / RUNOFF WILL FLOW DOWN TOWARD DISCHARGE PIPE.
6. ALL DRUMS ARE IN ONE LEVEL ON PALLETS.
7. 34 DRUMS OF TOP COAT CLASSIFIED NON-HAZARDOUS BASED ON EP TOXICITY ANALYSIS.
8. ONE DRUM OF HAZARDOUS WASTE STORED IN THIS AREA ■ - CHEMICAL SOLVENT. 2 DRUMS OF IGNITABLE WASTE SEGREGATED. (SEE ATTACHED DIAGRAM)

TANK STORAGE AREA

1. NO SIGN ON AREA.
2. NO BERM OR DIKE AROUND AREA
3. ONE SMALL TANK RECEIVES MAJORITY OF SPENT PHOTOGRAPHIC FIXER / DEVELOPER. PUMP FROM THIS SMALL TANK TO FOUR LARGER TANKS. TOTAL CAPACITY OF TANKS IS EQUAL TO 3000 - 4000 GALLONS.
4. FIBERGLASS TANKS - GOOD CONDITION, ONE TANK HOWEVER WAS ON BRICKS IN A LOPSIDED POSITION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

TANK STORAGE AREA

5. INSPECTION- OPERATOR SUPPOSEDLY INSPECTS SMALL TANK DAILY TO PREVENT OVERFLOW OF HAZARDOUS WASTE ONTO THE GROUND OR STORM DRAIN NEXT TO TANK. (SEE ATTACHED SHEET)

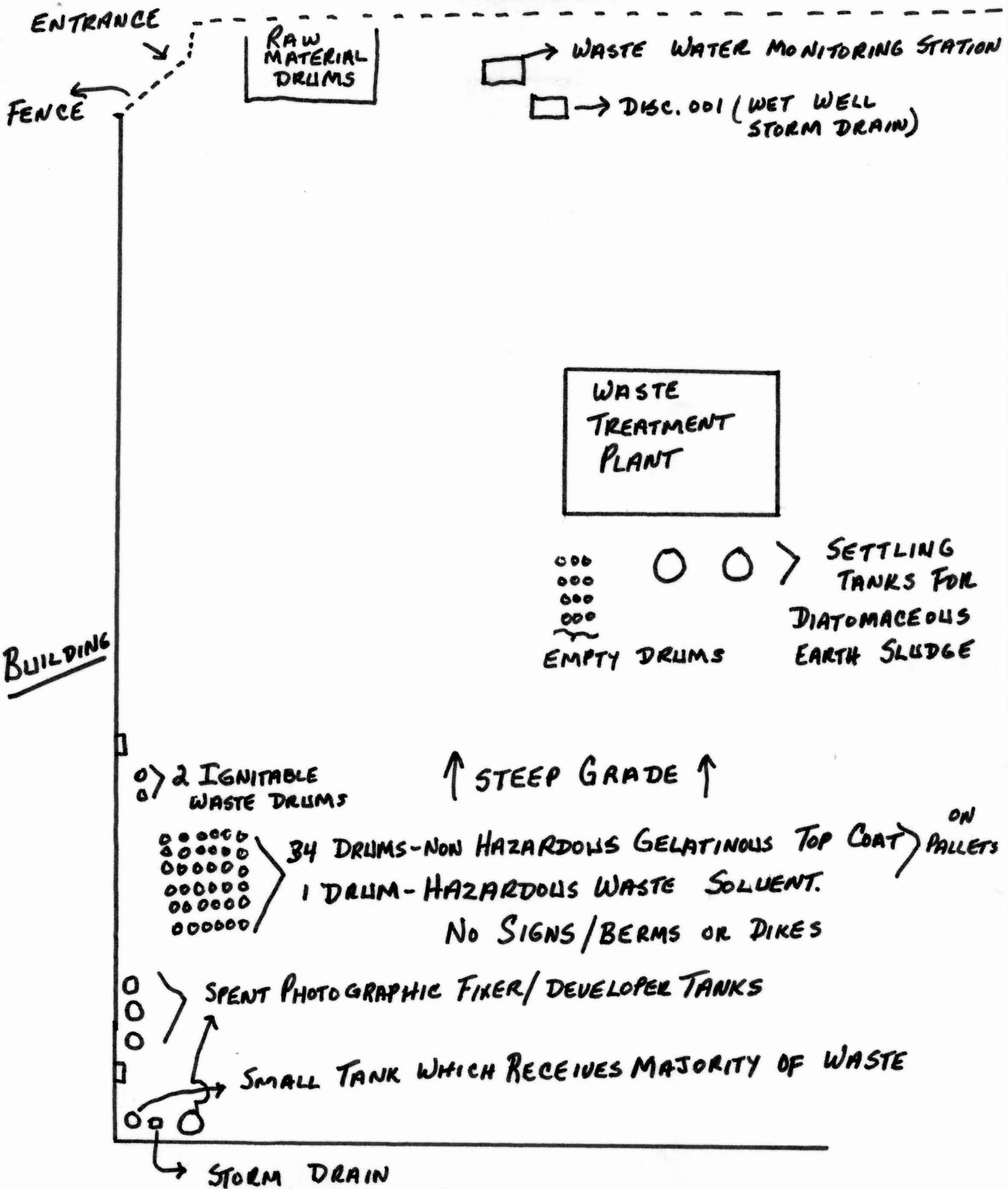
ACTIONS TAKEN BY PLANT PERSONNEL:

1. ALL DRUMS ARE CHECKED PRIOR TO BEING PLACED IN STORAGE AREA FOR LEAKS / LABELING.
2. MANAGER CLAIMS TO INSPECT STORAGE AREAS ON A DAILY BASIS. HOWEVER, NO WRITTEN LOG IS USED.
3. INTER-OFFICE MEMOS REGARDING HANDLING OF HAZARDOUS WASTE ARE ROUTINELY DISTRIBUTED TO PLANT PERSONNEL FROM ENVIRONMENTAL AFFAIRS MANAGER.
4. FIRE, EMERGENCY, EVACUATION AND CHEMICAL SPILL PREVENTION PLAN IS AVAILABLE AND LISTS EQUIPMENT, EMERGENCY PERSONNEL AND PHONE NUMBERS.

POWERS CHEMCO, GLEN COVE, N.Y.

12-2-81

HAZARDOUS WASTE STORAGE



POWERS CHEMCO, INC.

MANUFACTURER AND SUPPLIER TO THE GRAPHIC ARTS INDUSTRY

GLEN COVE, NEW YORK 11542

PHONE: 516-676-4000

August 12, 1980

E.P.A. Region II
Information Service Center
26 Federal Plaza
New York, N.Y. 10007

Dear Sir:

Pursuant to the Resource Conservation & Recovery Act please find Powers Chemco's Notice of Hazardous Waste Activity as required by the Environmental Protection Agency.

To the best of our knowledge the information submitted within was compiled using the most current data available. If there are any questions regarding the enclosed, please feel free to contact my office.

Very truly yours,

John Biedry

John Biedry
Environmental Affairs Manager

JB/lam

later

5/29 - 9:00 a.m.

POWERS CHEMCO, INC.

MANUFACTURER AND SUPPLIER TO THE GRAPHIC ARTS INDUSTRY

GLEN COVE, NEW YORK 11542

PHONE: 516-676-4000

?

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John Biedry

John Biedry
Environmental Affairs Manager

JB/lam

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY 1

RCRA GENERATOR INSPECTION CHECKLIST

Generator's Name: Powers Chemco, Inc. EPA I.D. #: NYD002056793

Generator's Address: Charles Street, Glen Cove, N.Y. 11542 Contact: John Biedry, Mgr., Env. Affairs

	YES	NO
1. Does generator have an EPA I.D. number?	(X)	( )
2. Does generator store material on-site?	(X)	( )
3. Is waste accumulated for more than 90 days?	( )	(X)
4. Does generator manifest waste?	(X)	( )
5. Does manifest show following information:		
a. Name, address, I.D. of generator	(X)	( )
b. Name, address, I.D. of transporter	(X)	( )
c. Name, address, I.D. of designated facility	( )	( )
d. Name, of alternative facility	( )	(X)
e. DOT waste description	(X)	( )
f. Quantity of waste-volume, weight, number of containers	(X)	( )
g. Signed certification statement	(X)	( )
6. Does generator maintain manifest records?	(X)	( )

7. General Comments:

Wastes include spent halogenated and non-halogenated solvents. In addition wastes containing fixers (silver and cadmium bearing) which are not all "hazardous" are treated as such, in terms of storage and handling. (cont.)

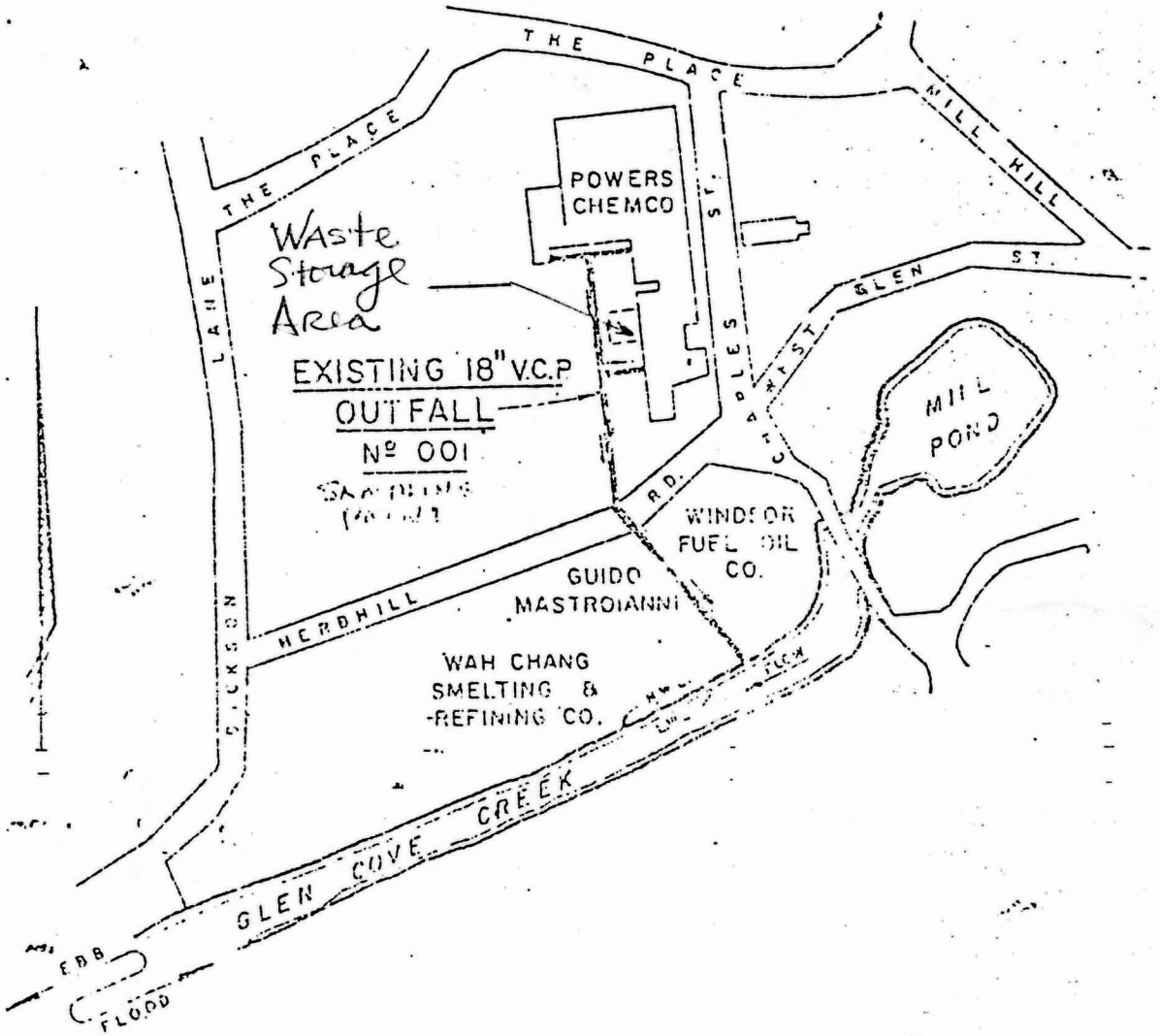
Inspected By: Frank A. Langone

Date: 5-29-81

These metal bearing wastes are transported off-site for reclamation.

Transporters: SCA, Inc.
Chemical Management, Inc.

Wastes are stored in metal drums on wooden skids, outside, in a driveway/receiving area in the center of the facility site. The permittee plans to build a berm around the storage area. At the time of the inspection approx. 60 drums were being held. No leaking drums were noticed.
Site security seems adequate.
Facility SPCC plan includes hazardous waste materials. Permittee reports no spills have occurred.


THE PLACE
THE PLACE
MILL HILL
POWERS CHEMCO
Waste Storage Area
EXISTING 18" V.C.P
OUTFALL
Nº 001
LANE
JACKSON
ST.
APLES
1ST ST.
GLEN ST.
MILL POND
RD.
WINDSOR FUEL OIL CO.
GUIDO MASTROIANNI
HERDHILL
WAH CHANG SMELTING & REFINING CO.
GLEN COVE CREEK
EBB
FLOOD

KONICA GRAPHIC IMAGING INTERNATIONAL, INC.
71 Charles Street, Glen Cove, New York 11542-2837
Tel:(516) 674-2500 • Fax:(516) 676-4124

June 28, 1999

Attn: Mr. George Meyer, P.E.
RCRA Compliance Branch
Division of Enforcement and Compliance Assistance
USEPA, Region 2
290 Broadway
New York, NY 10007-1866

Re: Response to EPA's May 14, 1999 letter

Dear Mr. Meyer:

This letter is in response to the EPA letter dated May 14, 1999 regarding the hazardous waste inspection on March 31, 1999 at the Konica Graphic Imaging (KGI) facility in Glen Cove, New York.

The responses will be presented in order of the issues raised in the EPA letter.

The date of accumulation now appears on all drums in KGI's outside waste storage area. Drums that have been transferred from satellite production areas have the date when the drum was filled. Other drums, used initially in the waste storage area, have a hazardous waste label with the date at the start of filling. Photographs of these drums are enclosed (see Appendix I).

Job descriptions are provided in Appendix II.

A list of emergency coordinators with the names, addresses and phone numbers is now provided in KGI's Spill Prevention, Control, and Countermeasures Plan (SPCC Plan). It is Konica's belief that the SPCC Plan contains the necessary elements as is required in the Contingency Plan and may be substituted for same. A copy of the SPCC Plan is enclosed.

A copy of KGI's Personnel Training Plan is also provided. It contains a course description provided internally as well as by an outside contractor for all affected employees. A copy of the latest employee training session is also enclosed.

If you have any questions or concerns with regards to this matter, please contact either myself (516-674-2732) or Daniel Romeo (516-674-2753).

Sincerely,

Charles Tozzo

Charles Tozzo, P.E.
Environmental & Safety Manager

Cc: D.Romeo, KGI

Appendix I – Photographs of Drums with the Hazardous Waste Label
And the Applicable Start or Finish Date

Photograph 1.

Photograph 2.

Photograph 3.

Photograph 4.

Photograph 5.

Photograph 6.

Appendix II – Job Titles and Descriptions

Employee Name	Title
Charles Tozzo	Environmental & Safety Manager
Daniel Romeo	Environmental Engineer
Anthony Randazzo	Safety Representative
Wayne Frey	Senior Process Operations Supervisor (Wastewater Treatment)
Peter Helmus	Process Technician IV (Wastewater Treatment)
Gabril Alarcon	Process Technician II (Wastewater Treatment)
Darren Pittman	Senior Process Operator (Reclamation)
Michael Kino	Scheduler Planner (Central Finals)
James McLoughin	Supervisor (Chem Mix)
Alan Wachtin	Supervisor (Central Finals)

Environmental & Safety Manager

This person is responsible for developing, implementing and coordinating policies and procedures that concern environmental and safety matters; reviews and recommends all corporate activities to assure regulatory compliance in air mission, wastewater and hazardous waste, tanks & chemical storage, employee safety and other applicable matters. Also, is an emergency coordinator and on the emergency response team.

Environmental Engineer

This person is responsible for environmental regulatory compliance and all associated matters; preparing and completing all routine regulatory reports (e.g., Form R, SARA 312, annual hazardous waste report, sewer use report). Assigns, schedules and assures proper manifests for all hazardous waste shipments. Maintains an awareness of applicable regulatory issues and reports issues of concern to the company; is an emergency coordinator and a member of the Emergency Response Team.

Safety Representative

This person is responsible for administering and coordinating all employee safety matters and programs, such as the hazard communication, respiratory and lockout/tagout. Also, assures that all corporate activities are in compliance with regulatory (e.g. OSHA) requirements. Maintains an awareness of applicable regulatory issues and reports issues of concern to the company; is a member of the Emergency Response Team.

Senior Process Operations Supervisor (Wastewater Treatment)

This person supervises the operation and maintenance of the wastewater treatment plant, which is designed to remove heavy metals from the industrial wastewater before discharge to the POTW; ensures the transfer of hazardous and non-hazardous wastes to central storage areas, including such matters as proper containers and labels; is an emergency coordinator and a member of the Emergency Response Team.

Process Technician (Wastewater Treatment) (two levels)

This person operates and maintains the wastewater treatment plant; is a member of the Emergency Response Team.

Senior Process Operator (Reclamation)

This person operates and maintains the silver reclamation department, including emulsion and topcoat processing, film shredding and containerization; is a member of the Emergency Response Team.

Supervisor/Scheduler Planner (Central Finals)

This person supervisors and/or schedules the preparation of chemical solutions for subsequent photographic coating operations, including raw material weighing, solution preparation and sampling; determines how to designate off-spec or out-of-date chemical solutions as either hazardous or non-hazardous waste; is a member of the Emergency Response Team.

Supervisor (Chem Mix)

This person supervisors the preparation of photographic chemical solutions, e.g., photographic developer and fixer, including raw material weighing, solution preparation and sampling; determines how to designate off-spec or out-of-date chemical solutions as either hazardous or non-hazardous waste; is a member of the Emergency Response Team.

Konica Graphic Imaging International, Inc.			
General Subject: ENVIRONMENTAL PROGRAMS			Number: 256-900
Specific Subject: SPILL PREVENTION, CONTROL, & COUNTERMEASURES PLAN (SPCC)			Effective Date: 09/01/98
Approvals: Name	T. Nagatani	W. Rettig	Date Prepared: 08/20/98
Title	President	Special Staff	
Ian Blundell	P.E. CERTIFICATION C. Tozzo	D. Romeo	Date Revised: NA
Special Staff	Environmental & Safety Manager	Environmental/Safety Engineer	
D. Pittmann	R. Wilson	Jim Mcloughlin	Page: 1 of 21
Supervisor/Silver Reclaimation	Manager-Silver Rec./Chem Mix	Supervisor/Chem Mix	

The Spill Prevention, Control, and Countermeasures Plan of Konica Graphic Imaging International, Inc., Glen Cove, New York (KGI)

The Spill Prevention, Control, and Countermeasures Plan of Konica Graphic Imaging International, Inc., Glen Cove, New York (KGI)

Provider: KGI Department of Environment Health and Safety
Original Prepared By: Daniel Romeo - Environmental/Safety Engineer
Revision: Original - September 1, 1998

Table of Contents

GENERAL INFORMATION

Emergency Phone Numbers

General Phone Number: (516) 674-2500 (Main Switchboard)

Emergency Response Team Activation Number: x44

IMPORTANT CONTACTS:

- KGI Emergency Coordinators:
  Charles Tozzo, **Emergency Coordinator** (516) 674-2753 Pager: (516) 525-7769
  Address: 23 Whaling Ave, Cold Spring Harbor, NY 11724
  Daniel Romeo, **Alternate EC** (516) 674-2753 Pager: (516) 525-7767
  Address: 336 Paumanake Ave, West Islip, NY 11795
  Darren Pittmann, **Alternate EC** (516) 674-2850 Pager: (516) 525-7761
  Address: 161 Glen Cove Ave, Glen Cove, NY 11542
- Glen Cove Hospital: 674-7300
- Glen Cove Fire Department: (emergency calls) 671-3730, (other) 676-0366
- Glen Cove Police Department: 676-1000
- Glen Cove LEPC: 676-2000
- Glen Cove POTW: 676-2200 or 671-4530
- Glen Cove Director of Public Works: 676-2000
- Nassau County LEPC: 535-7527/535-7524
- National Emergency Response Center: (800) 424-8802
- New York State Department of Environmental Conservation (DEC),
  Bureau of Spill Prevention & Response (24 hours): (800) 457-7362
- EPA Region II Office: (201) 321-6620 (800) 722-1223
- New York State Department of Transportation (DOT): 360-6219
- CHEMTREC (24-hour): (800) 424-9300
- POISON CENTER: 542-2323

- **Hazardous Material Spill Control Contractors:**
  ⇒ C.E.C.O.S. (212) 448-8585
  ⇒ Clean Harbors Environmental Services Company (800) 645-8265 [(800) OIL-TANK]
  ⇒ Chemical Management 454-6766

- **Location of Fire Extinguishers:**
  ⇒ Fire extinguishers are located in laboratories and hallways throughout the facility.

- **Location of Spill Supplies:**
  Spill supplies are located in "Spill Kits" in the following areas:
  ⇒ Central Finals
  ⇒ Dock #2
  ⇒ Main Building Warehouse
  ⇒ Hazardous Waste Storage Area
  ⇒ Dock #7

⇒ Dock #8
⇒ Pilot Plant

In addition, spill supplies are currently maintained by the Emergency Response Team in Silver Reclaimation.

- **Location of Fire Alarms:**
  - Fire alarms are located throughout the Main Building of KGI.

Site Specific Information

Plant Name: Konica Graphic Imaging International, Inc.
Plant Purpose: Manufacturing - Photographic Film, Paper, Chemistry
SIC Code: 3861
Address: 71 Charles Street, Glen Cove, NY 11542
Plant President: Toshio Nagatani
Designated Person Responsible for Spill Prevention (SPCC Coordinator):
Charles Tozzo, EH&S Manager
Assistant SPCC Coordinators:
Daniel Romeo, Environmental/Safety Engineer
Darren Pittmann, Supervisor/Silver Reclaimation

SECTIONS

I. Purpose

The intention of a Spill Prevention, Control and Countermeasures (SPCC) Plan is to establish the procedures and equipment required to prevent the unregulated discharge of oil, and hazardous substances, and hazardous waste in quantities that violate applicable water quality standards, cause a sheen upon or discoloration of the surface of navigable waters or adjoining shorelines, or cause sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines. The Plan also establishes the activities required to mitigate such discharges (i.e., countermeasures) should they occur.

II. Plan Authorization

This SPCC Plan has been prepared for Konica Graphic Imaging International, Inc. (KGI), pursuant to 40 CFR 112 (Protection of the Environment, Oil Pollution Prevention), and is authorized by management through the Department of Environmental Health and Safety. A complete copy of the Plan shall be maintained at the Office of Environmental Health and Safety, and be available to the New York State Department of Environmental Conservation (DEC) and the US Environmental Protection Agency (EPA) Regional Administrator, and his/her agents, upon request, for on-site review during normal working hours.

III. Scope

This plan applies to all sites where oil is stored, processed, distributed, or consumed, and could be reasonably expected to discharge oil in harmful quantities, and when the storage capacity of the site exceeds 1,320 gallons (currently, the aggregate storage capacity of KGI is approximately 35,000 gallons).

Responsible employees at the site shall become familiar with the contents of the Plan. The SPCC Coordinator shall be responsible for implementation of emergency spill response activities. In addition, two other full-time employees shall be trained as assistant SPCC Coordinators to assume the SPCC Coordinator's responsibilities in the Coordinator's absence.

IV. References

- KGI Hazardous Waste Operations Sheet
- Protection of Environment, Oil Pollution Prevention, 40 CFR Part 112

V. Definitions

Oil: means oil of any kind or in any form, including but not limited to petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.

Discharge: includes but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping

Navigable waters: means all waters of the United States that are connected with a navigable stream, lake, or sea. [Note: This definition is usually interpreted to mean any waterway (even a normally dry wash or storm sewer) that eventually drains into a navigable stream.

Hazardous Waste: as defined in 6NYCRR Part 371

VI. Plan Components and Assignments

A. Management Approval

This SPCC Plan has been reviewed and approved by management at a level with the authority to commit necessary resources to implement the Plan. The programs and procedures outlined in the Plan will be implemented and periodically reviewed and updated in accordance with 40 CFR 112, as amended.

B. Professional Engineer Certification

The SPCC Plan for any site must be reviewed and certified to be in accordance with good engineering practices by a Registered Professional Engineer.

C. Plan Reviews And Amendments

As set forth in 40 CFR 112, this SPCC Plan shall be reviewed and/or amended, if necessary, whenever there is a change in the design of the site, construction, operation, or maintenance which materially affects the site's potential for the discharge of regulated material.

The Plan will be reviewed and recertified by a registered professional engineer at least once every three years and will be amended if such review indicates more effective control and/or prevention technology will significantly reduce the likelihood of a spill event from the site.

D. Site Information

1. Physical Location and Regional Conditions

The Konica Graphic Imaging International, Inc., facility is a photographic film, paper and chemistry manufacturer situated on approximately 18 acres in Glen Cove New York. Figure 1 is a Map showing the site and surrounding area. Figure 2 & 3 are plot plans of the site and depict property boundaries and on-site structures.

The site is bordered by wooded, undeveloped properties to the West, The Place Avenue and residential properties to the North, Herb Hill Road and industrial properties to the South, and Charles Street and residential properties to the East.

2. Geology

The site lies in a hilly area of Glen Cove. The average depth to groundwater is approximately 12 to 15 feet. The site geology is composed of a soil/clay mixture underlay which the facility was built upon. The North Parking Lot area overlies a former swamp marsh.

3. Spill History

The site has not had a spill event (discharge of oil into or upon navigable waters) within the preceding twelve months.

E. Spill Prevention, Control And Countermeasures

All tanks locations (bulk storage - oil tanks and chemical tanks) are shown in Figures 2 &3. This plan is maintained and made available by the Department of Environmental Health and Safety . KGI is currently reviewing the need for secondary containment for chemical transfer stations. KGI falls under the EPA requirement to provide for transfer station secondary containment by December, 1999.

1. Aboveground and Underground Storage Tanks

There are 11 aboveground storage tanks (ASTs) and 2 underground storage tanks (USTs) at KGI. Appendix A indicates the locations of the tanks and provides details on tank capacity, contents, and spill containment capacity. Each tank is monitored while filling and visual inspections are performed and recorded at least once every week. An inspection log is kept on file in the

Environmental Health and Safety Department. All deliveries to and removals from the ASTs are monitored by either the tank truck driver or a KGI employee who remains in attendance the entire time the delivery/removal is taking place. There have been no reportable release/spill events at any of the ASTs.

2. Material Transfer Areas

Material transfer areas within the site associated with the ASTs consist of the immediate area around the tanks themselves. These areas consist of the tanks, the containment area, associated piping and valving, and the driveway areas where tank trucks will park while filling the tanks. During product transfers, the tank truck operator performs the transfer, and a KGI employee (or the tank truck driver) monitors the tank, associated piping, and the transfer area.

3. Transfer Areas

A release could occur at the location of one of the tank truck transfer areas, possibly as a result of a tank truck structural failure, a malfunction of the tank truck high liquid level sensor (thus resulting in tank overfill) or human error. The tank trucks as well as the storage tanks are equipped with valves or switches, allowing the operator or truck driver to immediately shut off the power to the pumping system.

Currently, there are no secondary containment systems for the transfer areas. However, KGI is reviewing the alternatives for such secondary containment to comply with the EPA requirement for secondary containment in transfer areas by December, 1999.

4. Security Measures

Access to KGI is restricted to employees, contractors and visitors. All employees and regular contractors are to wear visible ID badges made available by the Safety and Security Department. KGI employs a security staff that provides regular patrols to insure the safety of personnel and KGI facililties including oil and other chemical storage facilities. Direct access to aboveground storage tanks is restricted to authorized personnel or other specially trained and authorized personnel.

F. Site Drainage And Stormwater Management

1. Surface Drainage

The site drainage is controlled by the topographic elevation of the ground surface. Runoff from the site flows into any number of drains. A Stormwater Drainage System map, available as a suppliment to this plan in Appendix B, shows the locations of each of these drains on the site.

Other Migration Routes

The other major system that a release could possibly impact, and then could migrate off site, would be the sanitary sewer system. The sanitary sewer system has been constructed to service

the various buildings constructed on the property. The system consists of various connections to the buildings, and manholes where feed lines link into main header lines.

Other potential migration routes may include trench backfill of utilities including natural gas, electricity, telephone, and water lines.

G. Personnel Training

1. Spill Prevention Training

KGI personnel with responsibilities for compliance with the requirements of this Plan will participate in periodic training that teaches employees to perform their duties in a way to prevent the discharge of harmful quantities of oil or hazardous substances. This training will include familiarization with this Plan, emergency response procedures, equipment, systems, and material safety data sheets (MSDS) for the products stored onsite. Training will be provided by the SPCC Coordinator or Assistant Coordinator or an approved alternative. Training documentation will be maintained by the Office of Environmental Health and Safety.

New personnel will be instructed, as appropriate, within a reasonable time after entering the site. Contractors and other transient personnel will be advised of applicable spill prevention measures upon entering the site, as appropriate.

Tank truck drivers loading or unloading materials at the site shall adhere to the following guidelines:

- Remain with the vehicle at all times while loading/unloading;
- Drain the loading/unloading lines to the storage tank and close the drain valves before disconnecting said lines and make sure a drain pan or other appropriate containment device is located under the connections;
- Inspect the vehicles before departure to be sure all loading/unloading lines have been disconnected and all drain and vent valves are closed; and
- Immediately report any leakage or spillage, including quantity, to the KGI employee they are responsible to, or to the Spill Response Team, x500.

The foregoing instructions are to be accomplished via the sample Notice to Tank Truck Drivers found in Appendix C.

H. Emergency Procedures / Spill Response

1. General

US EPA regulations define a spill as the discharge of oil into, or upon, the navigable waters of the United States or adjoining shorelines, in harmful quantities. Harmful quantities are defined as a discharge that violates applicable water quality standards or causes a sheen upon, or discoloration of, the surface of the water or the adjoining shorelines. Contaminated ground water

may also have the potential to seep, leach, or flow into navigable waters which would be included in this definition. Storm sewers are considered to fall under the definition of a "navigable waterway" since most storm sewers eventually discharge into a navigable waterway.

An important facet of an effective response procedure during an oil or hazardous substance release incident is to keep the material separated from water to minimize migration and the resulting potential increase in human and environmental exposure. Every effort should be made to prevent spills and emphasize substance containment at the source rather than resort to separation of the material from expanded portions of the environment or downstream water.

2. Discovery of a Release

The person discovering a release of material from a container, tank, or operating equipment should initiate certain actions immediately, including:

- Report the incident immediately to the KGI Emergency Response Team (x500 or "speed dial" x44).

- Extinguish any sources of ignition. Until the material is identified as nonflammable and noncombustible, all potential sources of ignition in the area should be removed. Vehicles should be turned off. If the ignition source is stationary, attempt to move spilled material away from ignition source. Avoid sparks and movement creating static electricity.

- Identify the material released. Consult MSDS sheets which provide the information for proper identification of the characteristics of the released material. MSDS sheets for materials stored in containers greater than 110 gallons in volume may be attached to this plan in Appendix D.

- Attempt to stop the release at its source. Assure that no danger to human health exists first. Simple procedures (turning valves, plugging leaks, etc.) may be attempted by the discoverer if there are no health or safety hazards and there is a reasonable certainty of the origin of the leak.

- Initiate spill notification and reporting procedures. If there is an immediate threat to human life (e.g. a fire in progress or fumes overcoming workers), an alarm should be sounded or other available methods should be used to evacuate the necessary buildings, If these evacuation measures do not initiate a fire department response, a direct call to the Glen Cove Fire Department is necessary. Request the assistance of the fire department's hazardous materials response team if an uncontrollable spill has occurred and/or if the spill has migrated beyond the site boundaries.

3. Containment of a Release

If material is released outside a containment area, it is critical that the material be contained as quickly as possible. Action to be conducted may include:

- Attempt to stop the release at the source. If the source of the release has not been found; if special protective equipment is necessary to approach the release area; or if assistance is required to stop the release, a fire department response should be initiated. KGI's Emergency Response Team will then notify the appropriate department or agencies. KGI's Emergency Response Team and able bodied KGI personnel should be available to guide the fire department's efforts.

- Contain the material released into the environment. Following proper safety procedures, the spill should be contained by absorbent materials and dikes using shovels and brooms. Consult applicable MSDS sheets for material compatibility, and environmental precautions.

- Recover or cleanup the material spilled. As much material as possible should be recovered and reused where appropriate. Material which cannot be reused must be discarded as appropriate by the hazardous waste manager. Liquids absorbed by solid materials shall be transfered into an open top drum, or if the size of the spill warrants, into another appropriate storage tank. When drums are filled after a cleanup, the drum lids shall be secured and the drums shall be appropriately labeled identifying the contents, the date of the spill/cleanup, and the site name and location. Combining non-compatible materials can cause potentially dangerous chemical and/or physical reactions or may severely limit disposal options. Compatibility information can be found on the material safety data sheets.

- Clean up the spill area. Surfaces that are contaminated by the release shall be cleaned using an appropriate substance or water. Cleanup water must be minimized, contained and properly disposed. Occasionally, porous materials (such as wood, soil, or oil-dry) may be contaminated; such materials will require special handling for disposal.

- Decontaminate tools and equipment used in cleanup. Even if dedicated to cleanup efforts, tools and equipment that have been used must be decontaminated before replacing them in the spill control kit.

- Make notifications and reports to outside agencies. The SPCC Coordinator shall determine if a reportable spill has occurred and shall make all necessary notifications. Verbal notification to government agencies and emergency planning committees shall be executed, if necessary. In all cases where verbal notification is given, a confirming written report shall be sent to the same entity.

- Arrange for proper disposal of any waste materials. The waste material from the cleanup must be characterized pursuant to KGI Hazardous Waste Operations Sheet. Representative sampling and analysis may be necessary to make this determination. The waste must be transported and disposed of in compliance with all applicable laws and regulations.

- Review the SPCC Plan. Appropriate personnel shall review spill response efforts, notification procedures, and cleanup equipment usage to evaluate their adequacy during the episode. Where deficiencies are found, the plan shall be revised and amended.

4. Internal Report

Spills that are regulated per this plan must be documented using KGI's Incident Report Form. At a minimum, the report will document the following items:

- Date, time, and duration of the release;
- Type of Incident;
- Materials Involved;
- Extent of Injuries;
- Assessment of Potential Hazards;
- Recovered Material:
- SPCC Plan Discrepancies; and
- Prevention of Similar Incidents.

5. Spill, Fire, and Safety Equipment

Portable fire extinguishers are located throughout KGI hallways, are well marked, and are easily accessible. Records are kept on all fire equipment in service, and regular testing is performed in accordance with established procedures. A list of fire extinguishers is available from the Safety and Security Department

6. Liaison with Local Authorities

Copies of this plan will be submitted to the local fire department, police department, local hospital, spill control contractors, and any other concerned or interested parties as requested or needed by them. In addition, familiarization sessions will be held with personnel from these organizations as they feel necessary. It is important that personnel responding to an emergency are familiar with chemicals used, the possibilities for release of hazardous materials, and the location of the fire equipment such as hydrants, etc.

7. Other KGI Emergency Response Plans

KGI maintains a Contingency Plan for dealing with a major spill of hazardous material or waste.

I. Reporting Procedures / Emergency Reporting Contacts

In the event of an accidental spill, the KGI employee discovering the release will contact the Switchboard Operator (x500) or the Emergency Response Team (x44) as soon as possible after the incident has occurred. Contact preference is in the order listed. If spill discharge to surface water is imminent, emergency agencies should be notified as described below.

1. Internal Reporting

In the event of a spill, the following internal contacts shall be made:

Name & Telephone No:

- Switchboard Operator, x500
- Emergency Response Team, x44
  - ⇒ Charles Tozzo, SPCC Coordinator, x732 Pager # 525-7769
  - ⇒ Daniel Romeo, Assistant Coor., x753 Pager # 525-7767
  - ⇒ Darren Pittmann, Asistant Coor., x 850 Pager # 525-7761

3. Emergency Reporting Contacts & Reporting to Outside Agencies

After the SPCC Coordinator has been notified, he/she will conduct reporting to outside agencies, if necessary. If a spill threatens to reach an off-site waterway, and the spill cannot be contained and recovered by KGI Emergency Team personnel, then the following contacts shall be made by the SPCC Coordinator:

IMPORTANT CONTACTS:

- Glen Cove Fire Department: (emergency calls) 671-3730, (other) 676-0366
- New York State Department of Environmental Conservation (DEC), Bureau of Spill Prevention & Response (24 hours): (800) 457-7362
- EPA Region II Office: (201) 321-6620, (800) 722-1223
- Glen Cove Director of Public Works: 676-2000
- Nassau County LEPC: 535-7527/535-7524
- National Response Center (800)424-8802

The following information shall be communicated when reporting to outside agencies:

- name, title, telephone number, and address of reporter;
- name, telephone number, and address of the site/spill
- time, type, and amount of material involved;
- extent of injuries/illnesses, if known;
- possible hazards to human health and environment;
- any body of water involved;
- the cause of accident/spill; and
- the action taken or proposed by the site/personnel

Other Services

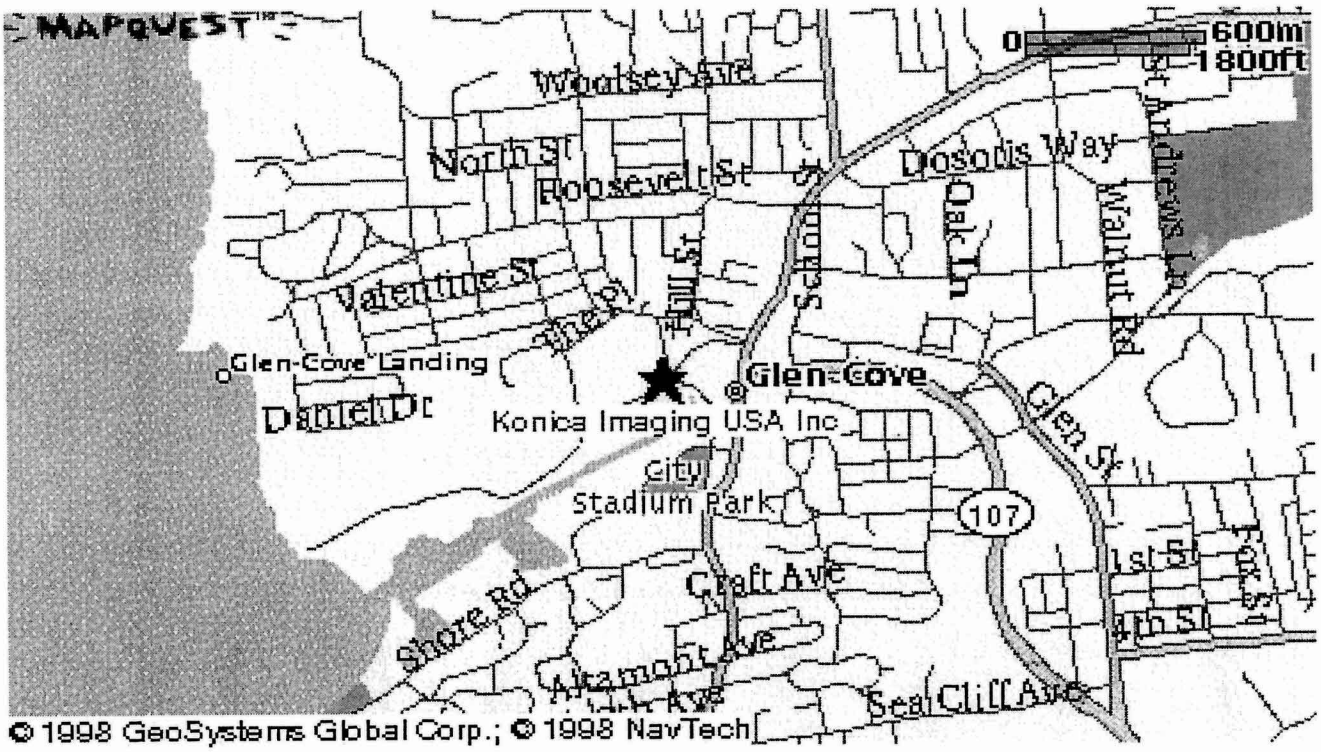
- CHEMTREC (24-hour): (800) 424-9300
- POISON CENTER: 542-2323
- **Hazardous Material Spill Control Contractors:**
  - ⇒ C.E.C.O.S. (212) 448-8585
  - ⇒ Clean Harbors Environmental Services Company (800) 645-8265 [(800) OIL-TANK]
  - ⇒ Chemical Management 454-6766

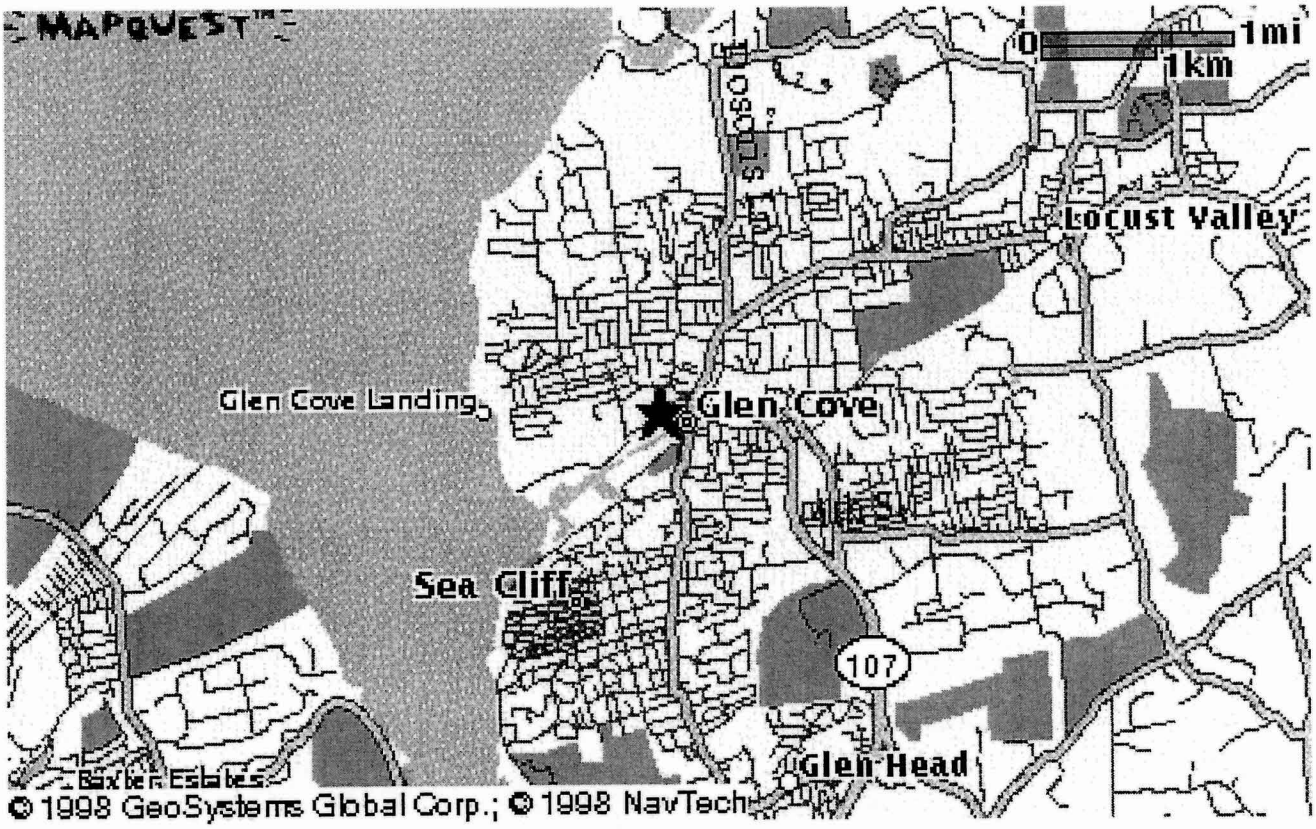
J. Site Inspection

All tanks and associated equipment must be inspected for malfunctions, deterioration's, or operator errors which may cause or lead to spills of oil hazardous substances and hazardous waste. The inspection shall be conducted by someone familiar with the tank system, and often enough to identify problems in time to correct them before a spill occurs. A written record of inspections will be kept on file. These records shall be retained for a minimum of one year. Inspections shall be conducted in accordance with a protocol established by the Environmental and Safety Department.

Figure #1:

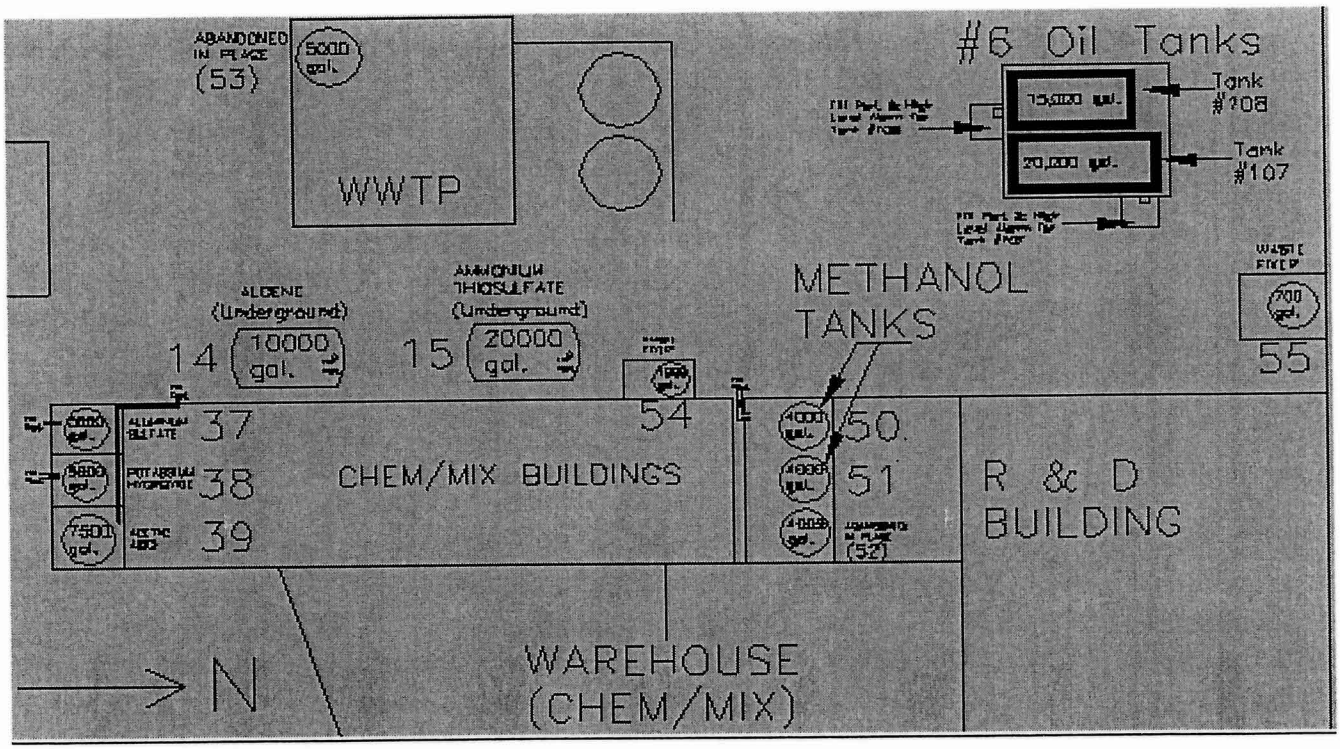
Location Map of the Site and Surrounding Area

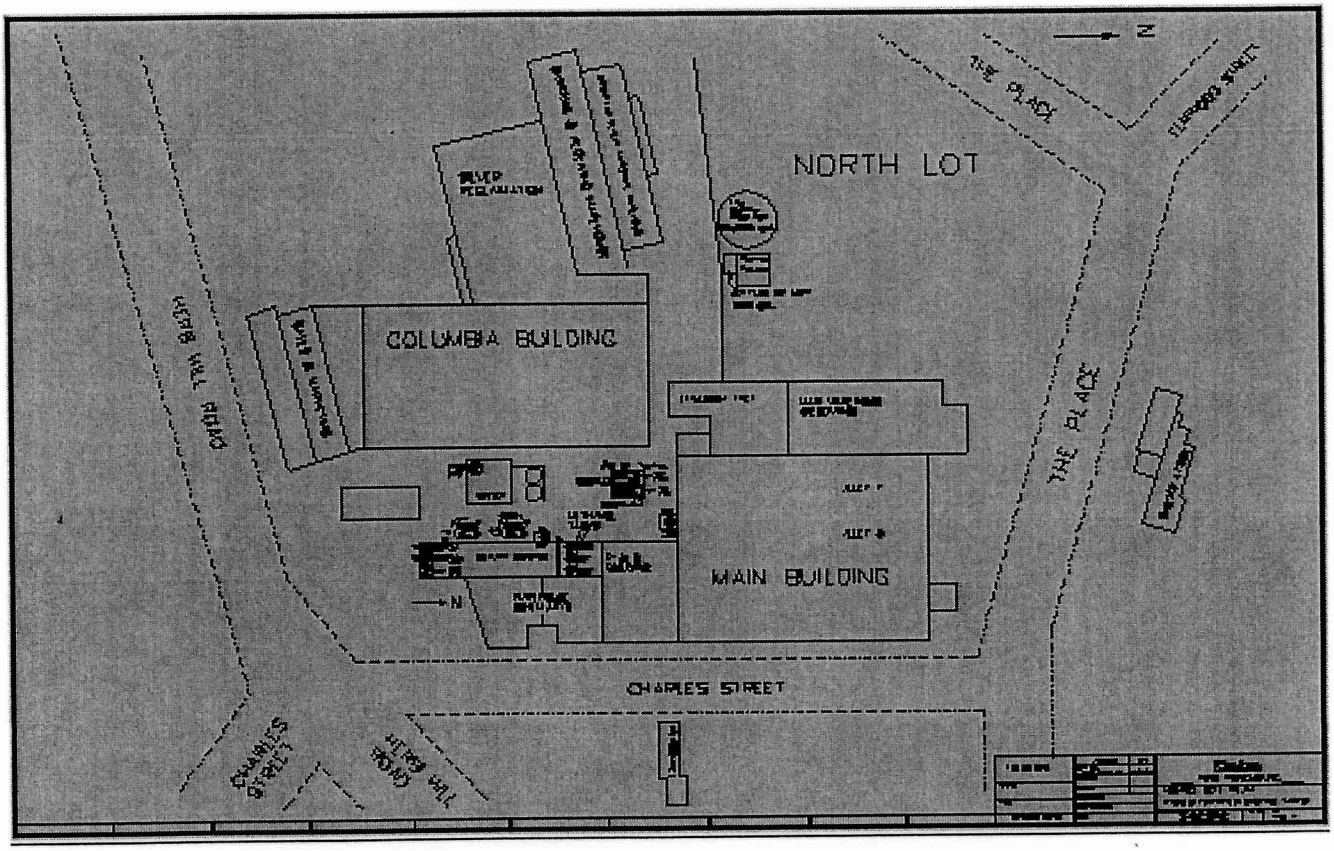




Figures #2 & #3:

Site Map (See Environ. & Safety Dept. for actual drawings)





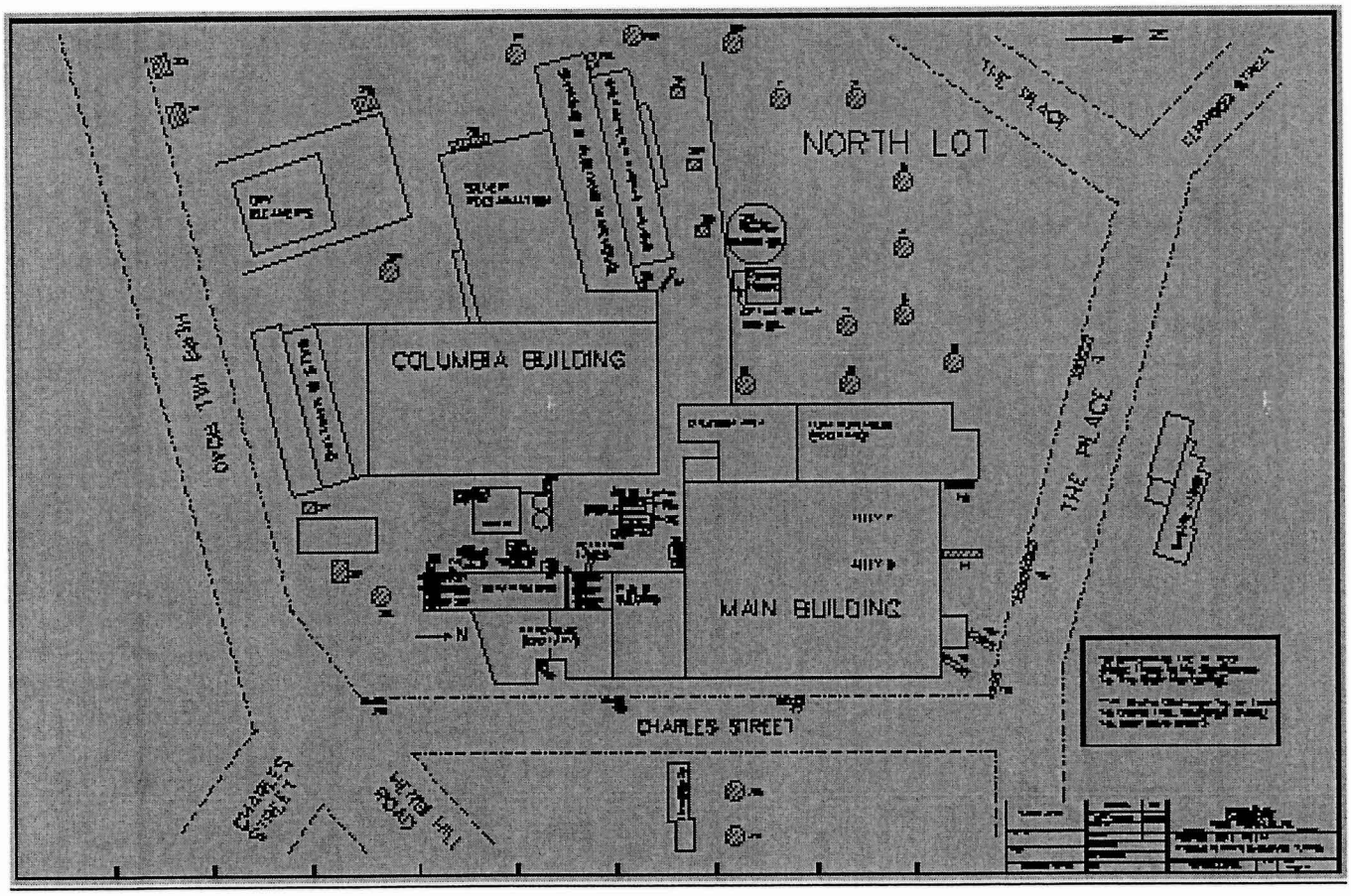
Appendix A

KGI Storage Tank Details

TANK #	*AST OR UST*	*CONTENTS*	*LOCATION*	*TANK CAPACITY (gallons)*	*SECONDARY CONTAINMENT CAPACITY*
14	UST	Aldene (Formaldehyde)	Outside Chem/Mix (South Lot)	10,000	None
15	UST	Ammonium Thiosulfate	Outside Chem/Mix (South Lot)	20,000	None
37	AST	Aluminum Sulfate	Inside Chem/Mix	5,000	> 110%
38	AST	Potassium Hydroxide	Inside Chem/Mix	5,000	> 110%
39	AST	Acetic Acid	Inside Chem/Mix	7,500	> 110%
50	AST	Methanol	Methanol Storage Room	4,000	> 110%
51	AST	Methanol	Methanol Storage Room	4,000	> 110%
54	AST	Waste Photo-Fixer	Outside Chem/Mix (South Lot)	1,000	> 110%
55	AST	Waste Photo-Fixer	Outside North end of South Lot	700	88%
107	AST	#6 Fuel Oil	Storage Area (South Lot)	20,000	> 110%
108	AST	#6 Fuel Oil	Storage Area (South Lot)	15,000	> 110%
-NEW- Not Yet In Service	AST	Aldene (Formaldehyde)	Inside Chem/Mix	5,000	> 110%
Non-Regulated	AST	**#2 Oil**	North Lot	500	None

Appendix B

Plot of Storm Drains:
(See Environ. & Safety Dept. for actual drawings)



Appendix C

Notice to Tank Truck Drivers

Tank Truck Drivers:

To prevent the release of substances hazardous to the environment, tank truck drivers entering this site are to comply with the following rules:

1. Exercise caution when maneuvering to avoid damage to KGI property.
2. Inspect tank, fitting, and liquid level indicator prior to filling.
3. Place drip pans under all pump hose fittings prior to loading/unloading.
4. Block truck wheels before starting to load/unload.
5. Remain with the vehicle while loading/unloading.
6. Drain loading/unloading line to storage tank when loading/unloading is complete.
7. Verify that all drain valves are closed before disconnecting loading/unloading lines.
8. Inspect vehicle before departure to be sure all loading/unloading lines have been disconnected and vent valves closed.
9. Immediately report any leakage or spillage to the KGI employee you are responsible to, the Switchboard Operator x500, or onsite KGI Emergency Response Team personnel.

Appendix D

Material Safety Data Sheet Source

(See Environ. & Safety Dept. for MSDS's)

Appendix E

Spill, Fire, and Safety Equipment

The following safety equipment is available in order to protect employees and provide containment of contaminants in the event of a spill:

Spill Response Team Area Spill Kit Inventory

Each of the areas designated a priority by the Spill Response Team, usually due to high material traffic, will have a permanently stationed spill response kit. These areas are mentioned in the Site Specific Information Section of this document. These response kits should contain the following inventory of response equipment:

1. 2-Cartons UXT universal absorbent pads
2. 3-UXT universal absorbent mini-booms (eight feet long)
3. 3-Bags granular absorbent
4. 2-Red poly shovels
5. 1-Orange street broom
6. 1-Blue street broom
7. 1-Small squeegee
8. 1-Large squeegee
9. 1-Roll caution tape
10. 1-Yellow absorbent scoop
11. 5-Clear poly drum liners
12. 2-Polylaminate spill suits
13. 2-Pair of splash goggles
14. 1-Bag of rubber gloves
15. 1-Bag of Like-Rags

** 16. 20 pound keg of Sodium Sulfite will be in the Monitor Bay Kits **only**

In addition, spill supplies are currently maintained by the Emergency Response Team in Silver Reclaimation and SCBA equipment is maintained in the WWTP Sampling Shed in the South Lot.

- **Location of Spill Supplies:**

  Spill supplies are located in "Spill Kits" in the following areas:

  ⇒ Central Finals
  ⇒ Dock #2
  ⇒ Main Building Warehouse
  ⇒ Hazardous Waste Storage Area
  ⇒ Dock #7
  ⇒ Dock #8
  ⇒ Pilot Plant

Emergency Response Refresher per OSHA's 29 CFR 1910.120: *HAZWOPER*

Presented By:
C2T
PO Box 708
Plainview, NY 11803
Voice: (516) 661-3477
Fax: (516) 391-9274
eMail: OSHAMD@aol.com

Table of Contents:

Pre Class "Quiz" (open book, open neighbor!!):

What does OSHA stand for, and what is the purpose of OSHA? _____

_____

What does HAZWOPER stand for? _____

Describe an Emergency (as in Emergency Response): _____

_____

_____

Describe a Hazardous Waste Operation: _____

_____

_____

Have you been involved in an Emergency Response or a Hazardous Waste Operation since your last HAZWOPER Refresher class? Yes? Of course you have!! Describe it here, along with a description of YOUR role in the activity:

_____

_____

_____

_____

_____

_____

Phone: *(516) 391-9271* ***Fax:*** *(516)391-9274* ***eMail:*** *OSHAMD@aol.com*

US Environmental Regulations: A Timeline.

1970 US Environmental Protection Agency or USEPA created to administer national environmental laws.

1972 US and Canada sign **Great Lakes Water Quality Agreement.**

1973 Congress passes the **Endangered Species Act.**

1974 Congress enacts the **Safe Drinking Water Act**, requiring USEPA to set public water quality standards.

1975 Energy Policy and Conservation Act signed by congress: fuel economy standards on autos sold in US.

1976 Congress enacts the **Resource Conservation Recovery Act** or **RCRA:** HAZWASTE regulation.

1976 Ford signs the **Toxic Substances Control Act** or **TSCA**, giving USEPA the power to "control development, manufacture and distribution of substances that may result in an unreasonable risk to health or environment".

1977 Congress enacts the **1977 Clean Air Act Amendments**.

1980 Congress passes **Comprehensive Environmental Response Compensation and Liability Act** or **CERCLA**, AKA **Superfund**, requires USEPA to address inactive/abandoned waste sites, & establish a list of hazardous substances.

1982 Congress enacts **Nuclear Waste Policy Act** to provide disposal of waste from power plants & weapon production.

1986 Congress enacts the **Emergency Planning and Community Right-to-Know Act** requiring States to designate emergency planning districts; industry to retain a MSDS for HAZMATS used & report releases.

1989 EPA announces a database called **TRI** (**Toxic Release Inventory**) which allows people to find out which toxic chemicals are being released from specific industrial facilities. **HAZWOPER** regulation enacted.

1990 The **Clean Air Act amendments of 1990** set timetables for the reduction of acid rain, CFCs, and certain air toxins. It also establishes a national permitting program and increases federal enforcement capabilities. The **Oil Pollution Act of 1990 (OPA '90)** enacted.

1991 Presiden~~t Bush~~ signs the **Recycling and Procurement Policy** to encourage recycling and the reduction of waste in Federal agencies, and to encourage the use of recycled products.

1994 President Clinton issues Executive Order 12898, **ordering government agencies to make environmental justice part of their missions**. The order requires agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations in the United States, February 11.

HAZWOPER Overview

I. REGULATION

(a) Scope, application and definitions. This regulation covers employees involved in:

- **Clean-up operations** (required by a governmental body, or voluntary) involving hazardous substances that are conducted at uncontrolled hazardous waste sites;
- **Corrective actions** involving clean-up operations at sites covered by Resource Conservation and Recovery Act (RCRA);
- Operations involving hazardous wastes that are conducted at **treatment, storage and disposal facilities** licensed under RCRA;
- **Emergency response operations** for release of, or substantial threats of release of, hazardous substances.

Exceptions are permitted if the employer can demonstrate that the operation does not involve employee exposure or a reasonable possibility of such exposure to hazards.

(b) Development by each hazardous waste site employer of a **safety and health program** designed to identify, evaluate, and control safety and health hazards, and provide for emergency response.

(c) A preliminary **evaluation of the site's characteristics** prior to entry by a trained person to identify potential site hazards and to aid in the selection of appropriate employee protection methods.

(d) Implementation of a **site control program** to prevent contamination of employees. At a minimum it must have a site map, site work zones, site communications, safe work practices and identification of the nearest medical assistance. Also required is the use of a "buddy system" as a protective measure in particularly hazardous situations so that employees can keep watch on one another to provide quick aid if needed.

(e) Training of employees is required before they are allowed to engage in hazardous waste operations or emergency response that could expose them to safety and health hazards. Specific training requirements are listed for clean-up personnel, equipment operators, general laborers and supervisory employees and for various levels of emergency response personnel. Persons completing specific training for hazardous waste operations shall be certified; those not certified nor with proper experience shall be prohibited from engaging in those operations specified by the standard.

Training requirements will vary with the type of operation involved. The various operations and their dependent training requirements are:

- **Uncontrolled hazardous waste operations** mandated by various levels of government training. These workers must have 40 hours of initial training before entering a site and at least three days of actual field experience under a trained, experienced supervisor. Employees visiting the site occasionally need only 24 hours of prior training and one day of supervised field experience. Managers and supervisors directly responsible for clean-up operations must have an additional eight hours of specialized training in waste management. Annual refresher training of eight hours is required for regular site workers and the managers.

- **Sites licensed under RCRA.** Employees must have 24 hours of training plus eight hours of annual refresher training.

- **Emergency response operations** at other than RCRA sites or uncontrolled hazardous waste site clean-ups. Five different levels of initial training are required depending on the duties and functions of each responder plus demonstrated competence or annual refresher training sufficient to maintain competence:

EMERGENCY RESPONSE TRAINING DETAILS:

(1) **FRA: First Responders Awareness** level (individuals likely to witness or discover a hazardous substance release and initiate the emergency response) must demonstrate competency in such areas as recognizing the presence of hazardous materials in an emergency, the risks involved, and the role they should perform.

(2) **FRO: First Responder Operations** level (individuals who respond for the purpose of protecting property, persons, or the nearby environment without actually trying to stop the release) must have eight hours of training plus "awareness level" competency or demonstrate competence in their role.

(3) **HMT: Hazardous Materials Technicians** (individuals who respond to stop the release) must have 24 hours of training equal to the "operations level" and demonstrate competence in several specific areas.

(4) **HMS: Hazardous Materials Specialists** (those who support the technicians but require a more specific knowledge of the substances to be contained) must have 24 hours of training equal to the technical level and demonstrate competence in certain areas.

(5) **OSIC: On-Scene Incident Commanders** (those who assume control of the incident scene) must be trained beyond the "awareness level" and demonstrate competence in specific areas.

(f) Medical Surveillance at least annually and at the end of employment for all employees exposed to any particular hazardous substance at or above established exposure levels and/or those who wear approved respirators for 30 days or more on site. Such surveillance also will be conducted if a worker is exposed by unexpected or emergency releases.

(g) Engineering controls, work practices and personal protective equipment, or a combination of these methods, must be implemented to reduce exposure below established exposure levels for the hazardous substance involved.

(h) Air **monitoring,** sampling, etc. is required to identify and quantify levels of hazardous substances with periodic monitoring to assure that proper protective equipment is being used.

(i) An **informational program** with the names of key personnel and their alternates responsible for site safety and health; and the listing of these requirements of the standard.

(j) Drum handling requirements at a Hazardous Waste Site is detailed in paragraph j.

(k) Implementation of a **decontamination procedure** before any employee or equipment may leave an area of potential hazardous exposure; operating procedures to minimize exposure through contact with exposed equipment, other employees, or used clothing; and showers and change rooms where needed.

(l) Emergency response by employees at **uncontrolled hazardous waste sites.**

(m) Illumination

(n) Sanitation at temporary workplaces.

(o) New technology programs.

(p) RCRA operations.

(q) Emergency response program to hazardous substance releases.

An emergency response plan to handle possible on-site emergencies prior to beginning hazardous waste operations. Such plans must address: personnel roles; lines of authority, training and communications; emergency recognition and prevention; safe places of refuge; site security; evacuation routes and procedures; emergency medical treatment; and emergency alerting.

An off-site emergency response plan to better coordinate emergency action by the local services and to implement appropriate control action.

Site Characterization/Site Control

Introduction. Site characterization/site control is the **defining of a contaminated area** and the **establishment of work zones** to control the movement of personnel and reduce the migration of contaminants. This is especially important in emergency situations and is useful any time you are working with hazardous substances. According to 29 CFR 1910.120(d) (the federal Hazardous Waste Operations and Emergency Response or "HAZWOPER" regulation promulgated by OSHA) appropriate site control measures must be implemented before cleanup work begins.

The site control program should be established in the planning stages of a project and modified based on new information and site assessments. The appropriate sequence for implementing these measures should be determined on a site-specific basis. In many cases, it will be necessary to implement several measures simultaneously. The following describes the basic components of a site control program at a hazardous materials spill or waste site.

Site map. A site map should be drawn showing:

- the **location** and size of the site;
- the site **topography** and accessibility by air and roads;
- all identified or suspected **safety and health hazards**;
- the **pathways for dispersion** of contaminants; and
- the status and capabilities of the **surrounding community**, including the nearest medical assistance.

The site map should be prepared prior to site entry and updated throughout the course of site operations to reflect accidents, changes in site activities, emergencies, hazards not previously identified, new materials introduced on site, vandalism, and weather conditions. Overlays can be used to help portray information without cluttering the map.

Site Preparation. Careful site preparation ensures that response activities go smoothly and worker safety is protected. The preparation of a site for activities in response to a hazardous materials emergency is usually not as detailed as in a post emergency clean-up or a long term cleanup effort. There are, however, certain aspects of site preparation that are identical to each of these activities.

For example:

- Eliminate the physical hazards from the work area. These hazards could include ignition sources, exposed or ungrounded electrical wiring, sharp or protruding edges, slip, trip and fall hazards, and unsecured objects that may dislodge and fall on workers;
- Arrange auto and pedestrian traffic flow patterns; and
- Provide adequate and safe illumination for work activities.

At a post emergency response or long-term clean-up effort, there may be other activities necessary to prepare a work site. For example, the construction of roadways, loading docks, and staging areas may be needed. The installation of phone lines, electrical wiring, and provisions for sanitary and rest facilities where not readily available might also be required to ensure a safe work environment.

Site Work Zones (Hot, Warm, Cold and Decontamination Corridor). The establishment of work zones will segregate the work activities and confine contamination to the appropriate areas. This allows personnel to be properly protected against all hazards present. Decontamination procedures are necessary to remove and isolate the hazardous material, and to prevent the spread of contaminants off-site.

Three frequently used work zones are the ***Hot Zone or Exclusion Zone***; the ***Warm Zone or Contamination Reduction Zone (CRZ)***; and the ***Cold Zone or Support Zone***. Delineation of these zones is based on the type and extent of contamination. The boundaries of all three zones may change as site work progresses depending on changes in site conditions, and as new information becomes available. Determination of each zone and the control of movement of personnel and equipment between zones is described below.

Hot Zone. The Hot Zone is the area of known or suspected contamination and the greatest potential for human exposure exists here. The primary activities in the Hot Zone include sampling, delineation of contamination and clean-up of the environment.

The outer boundary of the Hot Zone is called the Hotline. Whether during an emergency response, a post emergency clean-up or other hazardous waste operation, the Hotline should be established and clearly marked before entry into the Hot Zone. Access control points should be established at the edge of the Hot Zone to regulate the flow of personnel and equipment in and out, and to help verify that proper procedures for entering and exiting are followed. For example, entrance and exit corridors should be established to separate the personnel and equipment moving out of the Hot Zone from that moving in.

The personnel working in the Hot Zone may include the Field Team Leader, work parties, and specialized personnel such as heavy equipment operators. All personnel within the Hot Zone should wear the level PPE specified in the Site Safety Plan. The level of PPE required in the Hot Zone may vary, however, according to job assignment. The task of collecting samples from open containers might require Level B protection, while walk-through ambient air monitoring could be performed in Level C protection. When appropriate, different levels of protection within the Hot Zone should be assigned to promote a more flexible, effective, and less costly operation, while maintaining a high degree of safety.

The perimeter of the Hotline can be defined and established by:

- A **visual surveillance** of the site and the evaluation of collected sampling data (such as the results of any water, soil or air sampling conducted at the site)
- **Distances needed** to prevent an explosion, fire or airborne contaminants from affecting personnel outside the Hot Zone
- Consideration of the site size, **site constraints** and the physical area necessary for site operations
- Notice of **weather conditions** and the potential for contaminants to be blown off site by wind or washed off site by precipitation

It is important to remember that after the Hotline is established it should be clearly marked. The use of barrier tape, signs, fences, and cones aid in marking the Hotline. As new information becomes available, the location of the Hotline should be modified.

Warm Zone and the Decontamination Corridor. The Warm Zone is the transition area between the Hot Zone and the clean area or Cold Zone, so the Hotline is the boundary between the Hot and Warm Zones. The Warm Zone is designed to reduce the probability that the Cold Zone will become contaminated or affected by other site hazards. The distance between the Hot and Cold Zones provided by the Warm Zone, together with decontamination of workers and equipment, limits the spread of hazardous substances.

The most important activity that occurs in the Warm Zone is decontamination or decon. Decontamination procedures take place in a designated area within the Warm Zone called the Contamination Reduction Zone (CRZ) or the Decontamination Corridor. The Decontamination Corridor begins at the Hotline, crosses through the Warm Zone and ends in the Cold Zone. At least two lines of decontamination should be set up in the Decontamination Corridor, one for personnel and one for heavy equipment.
Other activities that may occur in the Warm Zone include respirator cartridge or SCBA bottle change, PPE clothing change, sampling and monitoring equipment supply and First Aid. Personnel within the Warm Zone are required to maintain internal communications, line-of-sight contact with work parties, work party monitoring (e.g., for air time left, fatigue, heat stress, hypothermia) and site security.

Personnel working within the decontamination corridor must also be protected from the hazardous material. As a "rule of thumb," the PPE worn by decontamination personnel should be the same level or one level lower than the entry team PPE. They should be well trained in the process of decontamination and in the Decontamination Procedures that are specific to the hazard.

When determining the location of the Decontamination Corridor and depending on the type of decontamination required, the following items may be considered:

- Decon procedures and amount of space necessary for the Decon Corridor
- Location of environmentally sensitive areas like lakes, streams and parks
- Site gradient
- Wind direction and speed
- Location of the Command Post and other Support facilities

Entry and exit between the Warm and Cold Zones is through separate access control points if feasible. To reenter the Cold Zone, personnel from the Hot and Warm Zones must go through the Decontamination Corridor and leave through the personnel exit access control point.

Cold Zone. The Cold Zone is the location of the administrative and other support functions needed to keep the operations in the Hot and Warm Zones running smoothly. These functions can include the Command Post or Incident Command Center, a medical station, an equipment and supply storage area, and a field laboratory. Any function that need not or cannot be performed in a hazardous or potentially hazardous area is performed in the Cold Zone. Personnel working in the Cold Zone may wear normal work clothing.

Cold Zone personnel are responsible for alerting the proper governmental agencies, medical services, and local emergency response teams in the event of an emergency. All emergency telephone numbers, evacuation route maps, and vehicle keys should be kept in the Cold Zone.

The size and location of the Cold Zone may be affected by the following factors:

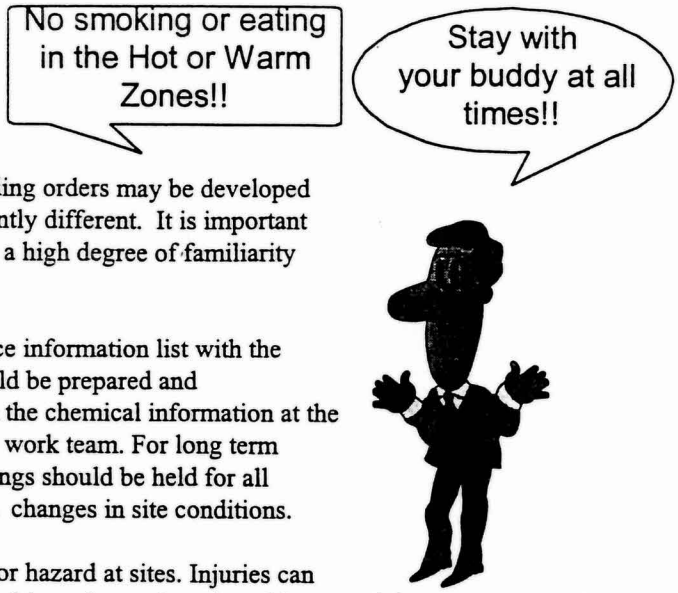
- Size and position of Hot and Warm Zones
- Physical area needed for required activities in Cold Zone
- Ability to maintain line-of-site contact with personnel in Warm and Hot Zones
- Accessibility to support services like power lines, telephones, shelter and medical services

Decontamination Procedures. Proper decontamination procedures help assure that Emergency Responders' health and safety is not compromised. The Decontamination Officer is responsible for keeping track of who has been through the Decontamination Corridor. The decontamination plan should initially be based on a "worst case" situation where all personnel are grossly contaminated when leaving the Hot Zone. Decontamination procedures must be tailored to the specific hazardous substance and the type of incident. For example, the decontamination procedures for an ongoing asbestos removal effort would include showers and scrubs of personnel and equipment, while the decontamination procedures for personnel responding to an accidental spill of diesel oil onto a roadway might simply call for the careful removal and disposal of PPE before re-entry into the Cold Zone. **All tools, clothing, PPE, trash, and run-off must be collected and isolated until the most appropriate disposal method can be determined.**

Basically, contamination can be removed from personnel and equipment in two ways, **physically** and **chemically**. Physical removal of contaminants might be brushing off, evaporation with steam jets, and washing with high pressure water showers. Examples of chemical removal methods are dissolving contaminants with solvents, rinsing and diluting with water, solidification of liquid contaminants with absorbents or polymerizing agents, and disinfection of biological contaminants.

When performing emergency response and hazardous waste operations there is always the chance that personnel could become injured or overcome by heat stress. It is important to remember that before an injured worker can be removed from the Hot or Warm Zones for medical attention, that he must be decontaminated. Emergency Decontamination Procedures should be part of the initial decontamination plan.

Safe Work Practices. Safe work procedures must be established as part of the site control plan to ensure worker safety. To maintain a strong safety awareness and enforce safe procedures at a site, Standard Operating Procedures (SOPs) or standing orders should be developed, like "No Smoking" or "Maintain radio Contact." Separate standing orders may be developed for the Warm and Hot Zones if the hazards are sufficiently different. It is important that personnel be briefed on the standing orders so that a high degree of familiarity with their content is maintained.



In addition to the standing orders, a hazardous substance information list with the names and properties of chemicals present on site should be prepared and conspicuously posted. Employees should be briefed on the chemical information at the beginning of the project or whenever they first join the work team. For long term hazardous waste cleanup operations, daily safety meetings should be held for all employees to keep personnel aware of site hazards and changes in site conditions.

Working with tools and heavy equipment can be a major hazard at sites. Injuries can result from accidents with heavy, impacts from flying objects, burns from hot objects, and damage to protective equipment such as supplied air respirator systems. Proper training for personnel in the safe use of such equipment, and equipment maintenance is essential to prevent injuries.

Site Security. Site security prevents the exposure of unauthorized people to site hazards, stops the increase of hazards by vandals or persons seeking to abandon hazardous or solid wastes on the site, and prevents theft. During an emergency response, physical barriers and signs, the local police department and specified personnel may be used to ensure the security of the site. During post emergency response and long term cleanup operations, fences, security guards and check-in/out procedures may be needed to guarantee site security.

To maintain site security during off-duty hours it is usually best to assign trained, in-house technicians for site surveillance. Security personnel may be less expensive but will be more difficult to train in safety procedures, and will therefore be less effective when reacting to problems around hazardous substances. Enlist public enforcement agencies, such as the local police and fire departments if the site presents a significant risk to public health and safety. Always secure all equipment overnight.

Communication Systems. An **internal communications system** must be established to facilitate communication between personnel working in the Hot or Warm Zones and communication from the Cold Zone to these workers. Internal communications are used to alert personnel to emergencies, pass on safety information, communicate site changes, and to maintain site control. It is important to take into account the limitations of personnel in PPE such as supplied air respirators. If electronic amplifying devices are used, they should be non-sparking or intrinsically safe.

An **external communication system** between on-site and off-site personnel is necessary to coordinate emergency response, report to management and maintain contact with essential off-site personnel. The primary means of external communication are telephone and radio. If telephone lines are not installed at a site, all team members should know the location of the nearest public telephone. The correct change and necessary telephone numbers should be readily available in the Support Zone.

Hazardous Substances.

Introduction. During an incident, response personnel may be exposed to a number of substances that are hazardous because of their biological, radiological, or chemical characteristics. **Biological agents** are living organisms (or their products) that can cause sickness or death to exposed individuals. **Radiological materials** are considered hazardous because of their ability to emit various types of radiation at intensities that may be harmful if response personnel are either inadequately shielded from the radiation source or exposed to the radiation for too long.

Chemical hazards are classified into several groups, such as flammable, toxic, corrosive, and reactive hazards. A material may exhibit more than one chemical hazard during an incident. *For example*, toxic vapors can be released during chemical fires. The hazards can be a result of the physical/chemical properties of a material, its chemical reactivity with other materials or the environment to which it is exposed.

Many hazards may be present at any one incident. It is important to understand the fundamentals of each, and their relationships, so that effective safety practices may be employed to reduce the risk to the public and response personnel.

Biological Hazards. There are five general categories of biological agents that are capable of causing infection or disease in exposed individuals. They are: viral, rickettsial/chlamydial, bacterial, fungal, and parasitic. These agent types may be present at hazardous waste sites and hazardous material spills. Like chemical hazards, they may be dispersed throughout the environment via wind and water.

Many biological agents have complex life cycles that require host and intermediate (carrier) host organisms to complete their growth cycles. Rodents, for example, which are commonly found at landfills, act as carriers for the rabies virus. Likewise, the Rocky Mountain Spotted Fever tick can carry the bacillus that produces this disease in man.

The same personnel protective requirements that are used against a chemical hazard can also be applied to biological hazards. Body coverings and respiratory protective equipment should be utilized. Personal cleanliness is especially important. Showering after removing protective clothing and thoroughly washing exposed body parts, including hands and face, should help remove any residual contamination.

Radiation Hazards.

Radioactive materials that may be encountered at a site can emit three types of harmful radiation: Alpha particles, Beta particles and Gamma Waves. All three forms harm living organisms by imparting energy that ionizes molecules in the cells. Hence, the three are referred to as ionizing radiation. Ionization may upset the normal cellular function causing cell dysfunction or death.

An Alpha particle is positively charged. The Beta is an electron possessing a negative charge. Both particles have mass and energy and both are emitted from the nucleus. They travel short distances in material before interactions with the material causes them to lose their energy. The outer layers of the skin and clothing generally protect against these particles. Therefore, they are considered hazardous primarily when they enter the body through inhalation or ingestion.

Gamma radiation is pure electromagnetic energy and is wave-like rather than particulate. Gamma waves pass through all materials to some degree. Clothing, including protective gear, will not prevent gamma radiation from interacting with body tissue.

Unlike many hazardous substances that possess certain properties that can alert response personnel to over-exposure (odor, irritation, or taste), radiation has no such warnings. Hence, preventing the radioactive material from entering the body or protecting against external radiation is the best protection. As with biological and chemical hazards, the use of respiratory and personnel protective equipment, coupled with scrupulous personal hygiene, will afford good protection against radioactive particulates.

Chemical Hazards.

A. Fire hazards

1. Combustibility

Combustibility is the ability of a material to act as a fuel. Materials that can be readily ignited and sustain a fire are considered combustible, while those that do not are called non combustible. Three elements are required for combustion to occur: fuel, oxygen and heat.

The concentration of the fuel and the oxygen must be high enough to allow ignition and maintain the burning process. Combustion is a chemical reaction that requires heat to proceed:

$$\textit{fuel} + \textit{oxygen} \xrightarrow{\textit{heat}} \textit{combustion}$$

Heat is either supplied by the ignition source and is maintained by the combustion, or supplied from an external source. The relationship of these three components of fire is illustrated by the triangle in Figure 1. Most fires can be extinguished by removing one of these components. For example, water applied to a fire removes the heat, thereby extinguishing the fire. When a material by itself generates enough heat to self-ignite, spontaneous combustion occurs, either as a fire or explosion.

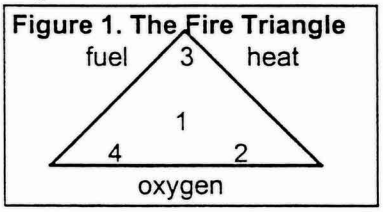
2. Flammability

Flammability is the ability of a material (liquid or gas) to generate a sufficient concentration of combustible vapors under normal conditions to be ignited and produce a flame. It is necessary to have a proper fuel-to-air ratio (expressed as the percentage of fuel in air) to allow combustion. There is a range of fuel concentrations in air for each material that is optimal for the ignition and the sustenance of combustion. This is called the Flammable Range.

The lowest concentration of fuel in this range is the Lower Flammable Limit (LFL). Concentrations less than the LFL are not flammable because there is too little fuel, that is, the mixture is too "lean." The highest ratio that is flammable is the Upper Flammable Limit (UFL). Concentrations greater than the UFL are not flammable because there is too much fuel displacing the oxygen (resulting in too little oxygen). This mixture is too "rich." Fuel concentrations between the LFL and UFL are optimal for starting and sustaining fire.

For Example: The LFL for benzene is 1.3% (13,000 ppm), the UFL is 7.1% (71,000 ppm), thus the flammable range is 1.3% to 7.1%.

Figure 1. The Fire Triangle



A fire can be defined as a self-sustaining, flaming combustion. Each side of the fire triangle represents one of the necessary elements of a fire. The optimal situation, position number 1, is the best fuel-to-oxygen ratio, with sufficient heat to ignite the fuel and support its combustion. Each corner illustrates the removal of one component: in number 2 there is insufficient fuel (concentrations below the Lower Flammable Limit), in number 3 there is not enough oxygen (concentrations above the Upper Flammable Limit), and in number 4 the heat source is not adequate.

The U.S. Department of Transportation (DOT), the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), and the National Fire Protection Association (NFPA) have established strict definitions for flammability based on the flash point of a material. In addition, materials may be classified as **flammable, combustible,** and **pyrophoric**.

Table 1. Typical flammable compounds and elements are:

- **Flammable** material is considered highly combustible if it can burn at ambient temperatures.
- **Combustible** material is not necessarily flammable, because it may not be easily ignited or the ignition maintained.
- **Pyrophoric** material will ignite at room temperature in the presence of air.

Flammable Liquids:		Flammable Solids:
• Aldehydes • Ketones • Amines • Ethers	• Aliphatic hydrocarbons • Aromatic hydrocarbons • Alcohols • Nitroaliphatics	• Phosphorus • Metal dusts • Raney nickel • Lacquer chips • Matches
Water-Reactive Flammable Solids:		**Pyrophoric Liquids:**
• Potassium • Sodium • Calcium carbide		• Organometallic compounds • Dimethyl zinc • Tributyl aluminum

3. Gas or Vapor Explosions

A gas or vapor explosion is a very rapid, violent release of energy. If combustion is extremely rapid, large amounts of kinetic energy, heat, and gaseous products are released. The major factor contributing to the explosion is the confinement of a flammable material. When vapors or gases cannot freely dissipate, they enter the combustion reaction more rapidly.

Confinement also increases the energy associated with these molecules, which enhances the explosive process. Poorly ventilated buildings, sewers, drums, and bulk liquid containers are examples of places where potentially explosive atmospheres may exist. Explosive gases/vapors exhibit an explosive range, which is the same as the flammable range. The upper explosive limit (UEL) and lower explosive limit (LEL) are the same as the UFL and LFL but in confined areas. Most reference books list either explosive limits or flammable limits, since they are identical.

4. Summary: Practical Considerations

Fires and explosions require fuel, air (oxygen), and an ignition source (heat). At a hazardous materials incident, the first two are not easily controlled. Consequently, while working on-site where a fire hazard may be present, the concentration of combustible gases in the air must be monitored and any potential ignition source must be eliminated.

The Most dangerous flammable substances:

- ✓ *are easily ignited (e.g., pyrophorics).*
- ✓ *require little oxygen to support combustion.*
- ✓ *have low LFL/LEL and a wide Flammable/Explosive range.*

There are various hazards related to fires and explosions, such as:

- ✓ physical destruction due to shock waves, heat and flying objects.
- ✓ initiation of secondary fires or creation of flammable conditions.
- ✓ release of toxic and corrosive compounds into the surrounding environment.

B. Explosive Hazard

1. Explosives

An explosive is a substance that undergoes a very rapid chemical transformation producing large amounts of gases and heat. Due to the heat produced, any gases produced, for example, nitrogen, oxygen, carbon monoxide, carbon dioxide, and steam, rapidly expand at velocities exceeding the speed of sound. This creates both a shock wave (high pressure wave front) and noise (brisance).

2. Types of Explosive Hazards

High or detonating: Chemical transformation occurs very rapidly with detonation rates as high as 4 miles per second. The rapidly expanding gas produces a shock wave that may be followed by combustion.

- Primary high explosive: detonating wave produced in an extremely short period of time. May be detonated by shock, heat, or friction. Examples are lead azide, mercury fulminate, and lead styphnate.

- Secondary high explosive: generally needs a booster to cause them to detonate. Relatively insensitive to shock, heat, or friction. Examples are tetryl, cyclonite, dynamite, and TNT.
- Low or deflagrating: Rate of deflagration up to 1000 feet per second. Generally combustion is followed by a shock wave. Examples are smokeless powder, magnesium, and molotv cocktail.

3. Practical Considerations

High or low does not indicate the explosion hazard (or power) but only the rate of chemical transformation.

Explosions can occur as a result of reactions between many chemicals not ordinarily considered as explosives. Ammonium nitrate, a fertilizer, can explode under the right conditions. Alkali metals and water explode; as will water and peroxide salts. Picric acid and certain ether compounds become highly explosive with age. Gases, vapors, and finely divided particulate, when confined, can also explode if an ignition source is present.

C. Toxic Hazards

1. Toxicity

Toxic materials cause local or systemic detrimental effects in an organism. Exposure to such materials does not always result in death, although that is often the most immediate concern. Types of toxic hazards can be categorized by the physiological effect they have on the organism. A material may induce more than one physiological response that may include: **asphyxiation, irritation, allergic sensitization, systemic poisoning, mutagenesis, teratogenesis** and **carcinogenesis**.

The likelihood that any of these effects will be experienced by an organism depends not only on the inherent toxicity of the material exposure (acute or chronic) and the route of exposure (ingestion, inhalation, skin absorption or injection.)

2. Toxicology Terminology

REL - Recommended Exposure Limit, usually a Time Weighted Average (TWA) concentration for up to a 10 hour work day in a 40 hour work week, published by NIOSH (National Institute of Occupational Safety and Health).

PEL - Permissible Exposure Limit, usually a TWA concentration for up to an 8 hour work day in a 40 hour work week, published by NIOSH.

IDLH - Immediately Dangerous to Life and Health is a condition "that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from a given contaminated environment." The purpose of establishing an IDLH exposure concentration is toe ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protective equipment. IDLH values are based on the effects that might occur as a consequence of a 30 minute exposure, however, the 30 minute period was not meant to imply that workers should stay in the work environment any longer than necessary. EVERY EFFORT SHOULD BE MADE TO EXIT IMMEDIATELY!!

STEL - A Short Term Exposure Limit is designated by "ST" preceding the value and is usually a 15 minute TWA exposure that should not be exceeded an any time during the workday.

C-PEL or C-REL - Ceiling Exposure Limit is designated by a "C" preceding the value and must not be exceeded at any time during the work day. Note: Ceiling values are instantaneous measurements, not TWAs.

Acute Exposure - Short term or one time. When something is an Acute hazard, exposure symptoms will be noticeable immediately or within a short time after the exposure incident.

Chronic - Long term or low, continuous dose. When something is a Chronic hazard, exposure symptoms will not likely be noticed on a daily basis. Sometimes, it takes a lifetime of exposures to generate exposure symptoms.

3. Measures of Concentration:

ppm - parts per million

mg/m^3 - milligrams per cubic meter

mppcf - millions of particles per cubic foot (of air as determined from counting an impinger sample)

$fibers/cm^3$ - fibers per cubic centimeter

D. Corrosive Hazards

1. *Corrosion*

Corrosion is the process of material degradation. Upon contact, a corrosive material may destroy body tissues, metals, plastics and other materials. Technically, corrosivity is the ability of material to increase the hydrogen ion or hydronium ion concentration of another material; it may have the potential to transfer electron pairs to or from itself or another substance. A corrosive agent is a reactive compound or element that produces a destructive chemical change in the material upon which it is acting. Common corrosives are the halogens, acids, and bases (Table 2). Skin irritation and burns are typical results when the body contacts an acidic or basic material.

Table 2. Corrosives.

Elements	Acids
• Bromine	• Acetic acid
• Chlorine	• Hydrochloric acid
• Fluorine	• Hydrofluoric acid
• Iodine	• Nitric acid
• Ozone	• Sulfuric acid
Bases (Caustics)	**Other Solvents**
• Potassium hydroxide	• Acetic anhydride
• Sodium hydroxide	• Hydrazine

The corrosiveness of acids and bases can be compared on the basis of their ability to dissociate (form ions) in solution. Those that form the greatest number of hydrogen ions (H+) are the strongest acids, while those that form the most hydroxide ions (OH-) are the strongest bases. The H+ ion concentration in solution is called pH. Strong acids have a low pH (many H+ in solution) while strong bases have a high pH (few H+ in solution; many OH- in solution).

The pH scale ranges from 0 to 14 as follows:

<--- increasing acidity * neutral*** increasing basicity -->**

0... 1... 2... 3... 4... 5... 6... 7... 8... 9... 10... 11... 12... 13 ...14

Measurements of pH are valuable because they can be quickly done on-site, providing immediate information on the corrosive hazard.

2. Practical Considerations:

- ✓ When dealing with corrosive materials in the field, it is imperative to determine:
- ✓ How toxic is the corrosive material?
- ✓ Is it an irritant or does it cause severe burns?
- ✓ What kind of structural damage does it do, and what other hazards can it lead to?
- ✓ For example, will it destroy containers holding other hazardous materials, releasing them into the environment?

E. Hazards Due to Chemical Reactivity

1. Reactivity Hazards

A reactive material is one that can undergo a chemical reaction under certain specified conditions. Generally, the term "reactive hazard" in used to refer to a substance that undergoes a violent or abnormal reaction in the presence of water or under normal ambient atmospheric conditions. Among this type of hazard are the pyrophoric liquids which will ignite in air at or below normal room temperature in the absence of added heat, shock, or friction, and the water-reactive flammable solids which will spontaneously combust upon contact with water (See Table 1).

2. Chemical Reactions

A chemical reaction is the interaction of two or more substances, resulting in chemical changes. Exothermic chemical reactions, which give off heat, can be the most dangerous. A separate source of heat is required to maintain endothermic chemical reactions. Removing the heat source stops the reaction. Chemical reactions usually occur in one of the following ways:

Combination:	**A+B→AB**
Decomposition:	**AB→A+B**
Single replacement:	**A+BC→ B+AC**
Double replacement:	**AB+CD→AD+CB**

The rate at which a chemical reaction occurs depends on the following factors:

- ✓ Surface area of reactants available at the reaction site (for example, a large chunk of coal is combustible, but coal dust is explosive)
- ✓ Physical state of reactant (solid, liquid or gas)
- ✓ Concentration of reactants
- ✓ Temperature and Pressure
- ✓ Presence of a catalyst

3. Compatibility

If two or more hazardous materials remain in contact indefinitely without reaction; they are compatible. Incompatibility, however, does not necessarily indicate a hazard. For example, acids and bases (both corrosive) react to form salts which may or may not be corrosive, and water.

Many operations ~~at waste~~ or accident sites involve mixing or unavoidable contact between different hazardous materials. It is important to know ahead of time if such materials are compatible. If they are not, then any number of chemical reactions could occur. The results could range from the formation of an innocuous gas to a violent explosion. Table 3 illustrates what happens when some incompatible materials are combined.

Table 3. Hazards due to chemical reactions (incompatibilities):

Hazard	Example
Generation of heat:	*-acid and water*
Fire:	*-hydrogen sulfide and calcium hypo chlorite*
Explosion:	*-picric acid and sodium hydroxide*
Toxic gas or vapor production:	*-sulfuric acid and plastic*
Flammable gas or vapor production:	*-acid and metal*
Formation of a substance with a greater toxicity than the reactants:	*-chlorine and ammonia*
Formation of shock or friction:	*-ammonia and iodine*
Pressurization of closed vessels:	*-fire extinguisher*
Solubilization of toxic substances:	*-hydrochloric acid and chromium*
Dispersal of toxic dusts and mists:	*-phosphorus trichloride and water*
Violent polymerization:	*-ammonia and acrylonitrile*

The identity of unknown reactants must be determined by chemical analysis to establish compatibility. On the bases of their properties, a chemist then should be able to anticipate any chemical reactions resulting from mixing the reactants. Judging the compatibility of more than two reactants is very difficult; analysis should be performed on a one-to-one basis.

Response personnel who must determine compatibility should refer to "A Method for Determining the Compatibility of Hazardous Waste" (EPA 600/2-80-076), published by EPA's Office of Research and Development. Final decisions about compatibility should only be made by an experienced chemist.

Sometimes the identity of a waste is impossible to ascertain due to money and time constraints. In this event, simple tests must be performed to determine the nature of the material or mixture. Tests such as pH, oxidation-reduction potential, and flash point are useful. In addition, very small amounts of the reactants may be carefully combined to determine compatibility.

4. Practical Considerations

If materials are compatible they may be stored together in bulk tanks or transferred to tank trucks for ultimate disposal. It is necessary, then, to establish the compatibility of the materials through analyses prior to bulking them.

Compatibility information is also very important in evaluating an accident involving several different hazardous materials. The ultimate handling and treatment of the materials may be partially based on such information.

F. Physical Properties of Chemicals

Chemical compounds possess inherent properties which determine the type and degree of the hazard they represent. Evaluating risks of an incident depends on understanding these properties and their relationship to the environment.

1. Solubility/Miscibility

The ability of a solid, liquid, gas, or vapor to dissolve in a solvent is called solubility. An insoluble substance can be physically mixed or blended in a solvent for a short time but is unchanged when it finally separates. The solubility of a substance is independent of its density of specific gravity. The solubility of a material is important when determining its reactivity, dispersion, mitigation, and treatment. Solubility is generally given in parts per million (ppm), percent by weight (w/v), or percent by volume (v/v).

Miscibility refers specifically to the solubility of a liquid in a solvent. This term is most often encountered when dealing with non-aqueous solutions.

2. Density and Specific Gravity

The density of a substance is its mass per unit volume, commonly expressed in grams per cubic centimeter (g/cc). The density of water is 1 g/cc, since 1 cc has a mass of 1 g.

Specific gravity (SpG) is the ratio of the density of a substance (at a given temperature) to the density of water at the temperature of its maximum density (4°C).

Numerically, SpG is equal to the density in g/cc, but is expressed as pure number without units. If the SpG of a substance is greater than 1 (the SpG of water), it will sink in water. The substance will float on water if its SpG is less than 1. This is important when considering mitigation and treatment methods.

3. Vapor Density

The density of a gas or vapor can be compared to the density of the ambient atmosphere. If the density of a vapor or gas is greater than that of the ambient air, then it will tend to settle to the lowest point. If vapor density is close to air density of lower, the vapor will tend to disperse in the atmosphere. Vapor density is given in relative terms similar to specific gravity.

In settling, dense vapor creates two hazards. First, if the vapor displaces enough air to reduce the atmospheric concentration of oxygen below 16%, asphyxia may result. Second, if the vapor is toxic, then inhalation problems predominate even if the atmosphere is not oxygen deficient. If a substance is explosive and very dense, the explosive hazard may be close to the ground rather than at the breathing zone (normal sampling heights).

4. Vapor Pressure

The pressure exerted by a vapor against the sides of a closed container is called vapor pressure. It is temperature dependent. As temperature increases, so does the vapor pressure. Thus, more liquid evaporates or vaporizes. The lower the boiling point of the liquid, the greater the vapor pressure it will exert at a given temperature. Values for vapor pressure are most often given as millimeters of mercury (mm Hg) at a specific temperature.

5. Boiling Point

The boiling point is the temperature at which a liquid changes to a vapor, that is, it is the temperature where the pressure of the liquid equals atmospheric pressure. The opposite change in phases is the condensation point. Handbooks usually list temperatures as degrees Celsius (°C) or Fahrenheit (°F). A major consideration with toxic substances is how they enter the body. With high-boiling-point liquids, the most common entry is by body contact. With low-boiling-point liquids, the inhalation route is the most common and serious.

6. Melting Point

The temperature at which a solid changes phase to a liquid is the melting point. This temperature is also the freezing point, since a liquid can change phase to a solid. The proper terminology depends on the direction of the phase change.

If a substance has been transported at a temperature that maintains a solid phase, then a change in temperature may cause the solid to melt. The particular substance may exhibit totally different properties depending on phase. One phase could be inert while the other highly reactive. Thus, it is imperative to recognize the possibility of a substance changing phase due to changes in the ambient temperature.

7. Flash Point

The minimum temperature at which a substance produces sufficient flammable vapors to ignite is its flash point. If the vapor does ignite, combustion can continue as long as the temperature remains at or above the flash point. If the ambient temperature in relation to the material of concern is right, then it may give off enough vapor at its surface to allow ignition by an open flame or spark.

The relative flammability of a substance is based on its flash point. An accepted relation between the two is:

Highly flammable: *Flash point less than 100°F*

Moderately flammable: *Flash point greater than 100°F but less than 200°F*

Relatively inflammable: *Flash point greater than 200°F*

8. Viscosity

Viscosity is the resistance of a fluid to flow. Normally, viscosity decreases with an increase in temperature, i.e., heating a fluid makes it easier to pour.

9. Ignition Temperature

The minimum temperature at which an external heat source is capable of igniting a flammable gas/air mixture is called the ignition temperature for a specific fuel. The temperature ranges from 400-1000°F for typical hydrocarbon fuels and must not be confused with the flash point (see above).

10. Flammable Range

The flammable range of a liquid is the concentration range, given as percent, or the vapor in air which will support combustion. The minimum concentration (%) of fuel in the flammable range is termed the Lower Flammable Limit (LFL) or Lower Explosive Limit (LEL). Similarly, UFL and UEL are used to demote the maximum concentration (%) which will ignite when mixed with air.

Personal Protective Equipment (PPE)

Introduction. Damaging effects chemical substances may have on human tissue as a result of skin contact requires the use of Personal Protective Equipment (PPE). The predominant physical, chemical, or toxic property of the material will dictate the type and degree of protection required. For example, protection against a corrosive hazard is different from that for a material that is a highly toxic vapor. The job and probability of exposure must be considered when choosing PPE. In the selection process, all potential dermal hazards must be investigated and identified in order to select the proper clothing material.

Once the hazard has been identified, correct clothing may be selected. Factors to consider during the selection process are: **Safety** afforded the worker; **compatibility** with job task; **performance**; **cost** and **availability**.

Protective clothing is available for most hazards found on any hazardous material job. Examples include hard hats, safety glasses, hearing protection, safety shoes all the way to different types of chemical protective clothing. Chemical protective clothing can range from heat resistant turnout gear (Nomex™) to fully encapsulating suits made from Teflon™ fused materials. The clothing must be selected to protect against the specific identified hazard.

Selection and Performance Requirements. Protective clothing is useful only when selected properly to protect the worker from the hazard at hand. In selecting PPE the following must be considered:

- **Chemical resistance** - protect against penetration and degradation of the suit by the chemical
- **Flexibility** - clothing that is not flexible will not be comfortable to the user. Glove and boot material must be flexible enough to be useful.
- **Strength** - The ability of the material to resist tears, rips, abrasion and punctures.
- **Temperature limits** - The clothing must also be able to function (protect) during whatever season the work is conducted.

Chemical Resistance. PPE will only be effective if it is able to resist permeation, degradation and penetration. All of these phenomena result in the potential for contact with the hazardous material. Factors influencing potential contact through permeation, degradation and penetration include length of time exposed, concentration and material resistance to the chemical.

Permeation results from the concept of concentration gradients. A material on the outside of a garment wants to flow to an area of lesser concentration (i.e.) the interior of the garment, much like oil flowing into a oleophilic material such as sorbent sweep or boom. Since all materials seek to establish an equilibrium, a contaminant will inherently try to seek equilibrium through the suit. Diffusion and other molecular forces act to drive the contaminant through the clothing material. When enough of the contaminant diffuses through the clothing, it condenses and continues to diffuse as long as the concentration is greater on the outside of the suit. The permeation rate is inversely proportional to the thickness of the protective material and directly proportional to the concentration of the chemical .

Penetration results from design and construction imperfections. Since most disposable garments are not one piece, penetration can result from poorly stitched seams, zippers that are missing teeth or are not designed properly, and porous fabric that ~~resulted~~ from poor quality assurance during the manufacturing process. Once a suit is torn or abraded, it must be considered useless in protecting a worker from the chemical hazard it was designed to guard against.

Degradation is the result of a chemical reaction between the contaminant and the hazardous chemical. Chemical reactions between the suit and the contaminant may result in causing the suit material to shrink, become brittle, swell, or completely fatigue.

Physical Strength. As with chemical resistance, manufacturer materials offer wide ranges of physical qualities in terms of strength, resistance to physical hazards, and operation in extreme environmental conditions. Comprehensive manufacturing standards such as the NFPA Standards set specific limits on these material

properties, but only for limited applications, i.e. emergency response. End users in other applications may assess material physical properties by posing the following questions:

- Does the material have sufficient **strength** to withstand the physical strength of the tasks at hand?
- Will the material **resist tears**, punctures, cuts, and abrasions?
- Will the material withstand **repeated use** after contamination and decontamination?
- Is the material **flexible** or pliable to allow end users to perform needed tasks?
- Will the material maintain its protective integrity and flexibility under **hot and cold** extremes?
- Is the material **flame resistant** or self-extinguishing? (if these hazards are present)
- Are garment **seams** in the clothing constructed so they provide the same physical integrity as the garment material?

The tricky and often confusing part of choosing proper PPE is judging it's chemical resistance. Some materials may be extremely affective against degradation, but will allow the chemical to permeate the suit rapidly. An example would be a standard cotton coverall. The cotton coverall will not degrade when worn around during a gasoline spill, however, gasoline vapor will penetrate the coverall resulting in a possible explosive atmosphere next to the workers body. All manufacturers provide some permeability data for PPE that they sell. The American Conference of Governmental Industrial Hygienists (ACGIH) publishes a guidebook called Guidelines for the selection of Chemical Protective Clothing. and is an excellent source of information. Information is also readily available for determining the degradation resistance of PPE by general chemical class.

Personal Protective Equipment Levels Chart.

Level	Skin	Respiratory	Comments
A	Totally Encapsulating Chemical Protective Suit (TECP Suit)	**Positive Pressure, Air Supplying** *SCBA* *Air-Line*	Chlorine Gas Highest Skin Protection
B	Hooded	**Positive Pressure, Air Supplying** *SCBA* *Air-Line*	Oxygen deficient Highest Respiratory Protection
C	Specific Skin Protection	**Negative Pressure*, Air Purifying Respirator** *1/2 or Full face APR*	Dusts, Mists, low levels of toxic material Moderate Respiratory Protection
D	Work Clothing with specific protection for procedure	**none** *nose hairs*	Small flammable liquid spills

* Level C Respiratory protection can also include a Positive Pressure PAPR (or Powered Air Purifying Respirator.)

Note: The Levels of Protection are specific for chemical exposure. Radiological, Physical and Biological hazards must also be taken into consideration when determining adequate PPE for an emergency response activity.

Protective Materials.

- **Nomex™** - Product of Dupont. Aromatic polyamide fiber. Non combustible and flame resistant to 428 ° F. Nomex™ is very durable and also provides good resistance to acids. Used in firefighters turnout gear and in some fully encapsulating suits as a base for rubber overcoating.
- **Polyethylene** - A fairly chemically resistant material that is used as a film, by itself, or a fabric coating. Used as a coating on the familiar Tyvek™ (e.g. Poly-coated tyvek) protective suit resulting in an increased resistance to acids, bases, and salts. Also used in disposable boots and gloves.
- **Polyvinyl Alcohol (PVA)** - A water soluble polymer that as long as it is not exposed to moisture, exhibits excellent resistance to many organic solvents that rapidly penetrate most rubber compounds. The material is somewhat stiff, limiting its effectiveness for intricate operations involving fine hand work.
- **Polyvinyl Chloride (PVC)** - A stiff polymer that is made suitable for protective clothing through the addition of plasticizers. Relatively good resistance to acids, alkalis, alcohol, mineral oils and mineral spirits. It is NOT recommended for use with petroleum products.
- **Saran** - A Polymer of Poly vinylidene chloride (PVDC) used as a laminate with Polyethylene
- **Saranex** - A multi-layer laminate of Polyethylene and Saran. This material provides a broad range of chemical resistance and is used as a general purpose disposable chemical protective garment. This material is not flame resistant and should not be used in flammable atmospheres or around heat, flame or sparks. It should also be noted that this material is NOT recommended for protection against Benzene, Toluene, Xylene, or similar organic compounds.
- **Tyvek** - A Dupont product. Spun bonded, non woven polyethylene fibers. Has reasonable tear, puncture and abrasion resistance. Provides excellent resistance to particulates and limited chemical splash protection.
- **Viton** - Product of Dupont. A proprietary Fluorelastomer similar to Teflon. Excellent resistance to degradation and permeation by aromatic and chlorinated hydrocarbons, and petroleum compounds. Very resistant to oxidizers. EXTREMELY expensive material used in gloves and fully encapsulating suits. Degraded by common compounds such as acetone, and is prone to tear and abrasion.

NOTE: There is no one "magic suit" that will protect a worker against all chemical hazards. Therefore, it is very important that all chemical hazards be identified and that PPE is chosen based on the suitability of the material to protect the worker against each chemical.

Types of Protective Clothing.

The selection of appropriate protective gear is based on the hazards anticipated or recognized. Complete protections calls for assembling a selection of gear that includes a hard hat, safety glasses and/or face shield, body covering, gloves and safety shoes with steel toe and shank. The omission of one piece of the ensemble may result in the compromise of the workers safety.

Some pieces of protective equipment have specific standards for manufacture. For example, shoes and hard hats must meet minimum standards set by the American National Standards Institute (ANSI). Only those items meeting the standards should be used.

NOTE: There are no such standards for chemical protective clothing. The choice of garment must be made using the best possible judgment and information available.

OSHA standards require employers to furnish and require employees to use suitable protective equipment where there is a "reasonable probability" that injury can be prevented by such equipment. The standards also set provisions for specific equipment.

While use of personal protective equipment is important, it is only a supplementary form of protection, necessary where all hazards have not been controlled through other means such as engineering controls. Engineering controls are especially important in hearing and respiratory protection which have specific standards calling for employers to take all feasible steps to control the hazards.

There are many types of PPE Head Protection, Foot and Leg Protection, Eye and Face Protection, Ear Protection, Arm and Hand Protection, Respiratory Protection, Body Protection and specific **Chemical Protective Clothing**.

Wearing protective clothing creates some problems, the most worrisome of which is **heat stress**. Heat stress results from the body not being able to evaporate sweat and cool down. Since most chemical hazards that require protection from are liquids, most PPE is effective in keeping that liquid out and sweat in. Without the ability to cool the body, the body becomes prone to heat stress and even heat stroke, which can be fatal. heat related problems are common at temperatures above 75°F. Work schedules for persons wearing chemical protective clothing must be closely and conservatively regulated. Being conservative with work schedules helps prevent heat stress from becoming a bigger hazard than exposure to the chemical.

The 3 Priorities of Emergency Response:

1 Life and Health!

2 Environmental Impact!

3 Cost $$$!

Selection of Respiratory Equipment.

Introduction.

Respiratory protection is of primary importance since inhalation is one of the major routes of exposure to toxic chemicals. Respiratory protective devices (respirators) consist of a facepiece connected to either an air source or an air-purifying device.

Atmosphere-Supplying Respirators, are those respirators that rely on a supplied source of air for their operation. There are two basic types of Atmosphere-Supplying Respirators:

- Self-Contained breathing apparatus (SCBAs) which supply air from a source carried by user.
- Supplied-air respirators (SARs) which supply air from a source located some distance away and connected to the user by an air-line hose. Supplied-air respirators are sometimes referred to as air-line respirators.

Air-purifying respirators, on the other hand, do not have a separate air source. Instead, they utilize ambient air which is "purified" through a filtering element called a cartridge prior to inhalation.

TABLE taken from: 29 CFR 1910.134 Respiratory Protection

Atmospheric contaminants to be protected against	**Colors assigned (1)**
Acid gases.	White.
Hydrocyanic acid gas.	White with 1/2-inch green stripe completely around the canister near the bottom.
Chlorine gas.	White with 1/2-inch yellow stripe completely around the canister near the bottom.
Organic vapors.	Black.
Ammonia gas.	Green.
Acid gases and ammonia gases.	Green with 1/2-inch white stripe completely around the canister near the bottom.
Carbon Monoxide.	Blue.
Acid gases and organic vapors.	Yellow.
Hydrocyanic acid gas and chloropicrin vapor.	Yellow with 1/2-inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, ~~fumes,~~ mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with 1/2-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants.	Red with 1/2-inch gray stripe completely around the canister near the top.

Footnote(1) Gray shall not be assigned as a main color for a canister designed to remove acids or vapors. NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

Protection Factors. The level of protection that can be provided by a respirator is indicated by the respirator's protection factor. This number, which is determined experimentally by measuring facepiece seal and exhalation valve leakage, indicates the relative difference in concentrations of substances outside and inside the facepiece that can be maintained by the respirator. For example, the protection factor for full-facepiece air-purifying respirators is 50. This means, theoretically, that workers wearing these respirators should be protected in atmospheres containing chemicals at concentrations that are up to 50 times higher than the Permissible Exposure Limit (PEL). In other words, for every fifty contaminate parts outside the mask, one will enter the facepiece and be inhaled by the user.

Protection Factors Table

	ANSI	NIOSH	OSHA		ANSI	NIOSH	OSHA
Air Purifying				**Airline**			
1/2 Face	10	10	10	1/2 Face PD	< IDLH	1,000	1,000
Full Face	100	50	10/50	Full Face PD	< IDLH	2,000	1,000
PAPR				**SCBA**			
1/2 Face	3,000	50	50	Full Face D	100	50	50
Full Face	3,000	50	250	Full Face PD	10,000	10,000	1000/ IDLH
Helmet/ Hood	3,000	25	25				

One source of protection factors for various types of atmosphere-supplying (SCBA and SAR) and air-purifying respirators can be found in American National Standards Institute (ANSI) standard ANSI Z88.2-1980.

At sites where the identity and concentration of chemicals in air are known, a respirator should be selected with a protection factor that is sufficiently high to ensure that the wearer will not be exposed to the chemicals above the applicable limits. These limits include the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs), OSHA's Permissible Exposure Limits (PELs), and the NIOSH Recommended Exposure Limits (RELs). These limits are designed to protect most workers who may be exposed to chemicals day after day throughout their working life. *The OSHA PELs are legally enforceable exposure limits, and are the minimum limits of protection that must be met.*

It should be remembered that the protection factor provided by a respirator can be compromised in several situations, most notably,

(1) if a worker has a high breathing rate,
(2) if the ambient temperature is high or low, or
(3) if the worker has a poor facepiece-to-face seal.

At high breathing rates, positive-pressure is only maintained for brief periods during peak inhalation. Also, at high work rates, exhalation valves are more prone to leak. Consequently, positive pressure respirators working at high flow rates may offer less protection than when working at normal rates.

A similar reduction in protection may result from high or low ambient temperatures. For example, at high temperatures, excessive sweat may cause a break in the face-to facepiece seal. At very low temperatures, the exhalation valve and regulator may become ice-clogged due to moisture in the breath and air. Likewise, a poor facepiece seal due to such factors as facial hair, missing teeth, scars, lack of, or improper, fit testing, etc.-can result in the penetration of air contaminants.

Self-Contained Breathing Apparatus (SCBA).

Key questions to ask when considering whether an SCBA is appropriate are:

? Is the atmosphere IDLH or is it likely to become IDLH? If yes, a positive-pressure SCBA should be used. A positive-pressure SAR with an escape SCBA can also be used.

? Is the duration of air supply sufficient for accomplishing the necessary tasks? If no, a larger cylinder should be used, a different respirator should be chosen, and/or the Work Plan should be modified.

? Will the bulk and weight of the SCBA interfere with task performance or cause unnecessary stress? If yes, use of an SAR may be more appropriate if conditions permit.

? Will temperature effects compromise respirator effectiveness or cause added stress on the worker? If yes, the work period should be shortened or the mission postponed until the temperature changes.

Supplied-Air Respirators (SARs).

Key questions to ask when considering SAR use are:

? Is the atmosphere IDLH or likely to become IDLH? If yes, a SAR/SCBA combination or SCBA should be used.

? Will the hose significantly impair worker mobility? If yes, the work task should be modified or other respiratory protection should be used.

? Is there a danger of the air line being damaged or obstructed (e.g., by heavy equipment, falling drums, rough terrain, or sharp objects) or permeated and/or degraded by chemicals (e.g., by pools of chemicals)? If yes, either the hazard should be removed or another form of respiratory protection should be used.

? If a compressor is the air source, is it possible for airborne contaminants to enter the air system? If yes, have the contaminants been identified and are efficient filters and/or sorbents available that are capable of removing those contaminants? If no, either cylinders should be used as the air source or another form of respiratory protection should be used.

? Can other workers and vehicles that might interfere with the air line be kept away from the area? If no, another form of respiratory protection should be used.

29 CFR 1910.146: Permit Required Confined Space Fact Sheet

(a) Scope, Application

(b) Definitions

Confined space means a space that:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

(3) Is not designed for continuous employee occupancy.

Hazardous atmosphere means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(1) Flammable gas, vapor, or mist in excess of **10 percent of its lower flammable limit (LFL);**

(2) Airborne **combustible dust** at a concentration that meets or exceeds its LFL;

(3) Atmospheric **oxygen concentration below 19.5 percent or above 23.5 percent;**

(4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this part and **which could result in employee exposure in excess of its dose or permissible exposure limit;**

(5) Any other atmospheric condition that is immediately dangerous to life or health.

Non-permit confined space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Permit-required confined space (permit space) means a confined space that has one or more of the following characteristics:

(1) Contains or has a potential to contain a **hazardous atmosphere;**

(2) Contains a material that has the potential for **engulfing** an entrant;

(3) Has an **internal configuration** such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross- section; or

(4) Contains **any other recognized serious safety or health hazard.**

(c) General Requirements

Employer will evaluate workplace for Confined Spaces, inform employees of Confined Spaces, and then determine whether employees will enter such spaces. If employees will enter Confined Spaces, employer must comply with the requirements of this section.

(d) Permit Required Confined Space Program

(e) Permit System

(f) Entry Permit

(g) Training

The employer shall provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.

(h) Duties of authorized entrants.

The employer shall ensure that all authorized entrants:

(1) Know the hazards that may be faced during entry.

(2) Properly use equipment as required by paragraph (d)(4) of this section;

(3) Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to

enable the attendant to alert entrants of the need to evacuate the space as required by paragraph (i)(6) of this section;

(4) Alert the attendant whenever:

(i) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or

(ii) The entrant detects a prohibited condition; and

(5) Exit from the permit space as quickly as possible whenever:

(i) An order to evacuate is given by the attendant or the entry supervisor,

(ii) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,

(iii) The entrant detects a prohibited condition, or

(iv) An evacuation alarm is activated.

(i) Duties of attendants.

The employer shall ensure that each attendant:

(1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Is aware of possible behavioral effects of hazard exposure in authorized entrants;

(3) Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants under paragraph (f)(4) of this section accurately identifies who is in the permit space;

(4) Remains outside the permit space during entry operations until relieved by another attendant;

(5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space under paragraph (i)(6) of this section;

(6) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions;

(i) If the attendant detects a prohibited condition;

(ii) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;

(iii) If the attendant detects a situation outside the space that could endanger the authorized entrants; or

(iv) If the attendant cannot effectively and safely perform all the duties required under paragraph (i) of this section;

(7) Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;

(8) Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:

(i) Warn the unauthorized persons that they must stay away from the permit space;

(ii) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and

(iii) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;

(9) Performs non-entry rescues as specified by the employer's rescue procedure; and

(10) Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

(j) Duties of entry supervisors.

The employer shall ensure that each entry supervisor:

(1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;

(3) Terminates the entry and cancels the permit as required by paragraph (e)(5) of this section;

(4) Verifies that rescue services are available and that the means for summoning them are operable;

(5) Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and

(6) Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

(k) Rescue and emergency services.

(1) The following requirements apply to employers who have employees enter permit spaces to perform rescue services.

(i) The employer shall ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces.

(ii) Each member of the rescue service shall be trained to perform the assigned rescue duties. Each member of the rescue service shall also receive the training required of authorized entrants under paragraph (g) of this section.

(iii) Each member of the rescue service shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, mannequins, or actual persons from the actual permit spaces or from representative permit spaces. Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

(iv) Each member of the rescue service shall be trained in basic first-aid and in cardiopulmonary resuscitation (CPR). At least one member of the rescue service holding current certification in first aid and in CPR shall be available.

[58 FR 4549, Jan. 14, 1993; 58 FR 34885, June 29, 1993, as amended at 59 FR 26114, May 19, 1994]

APPENDICES TO 1910.146-PERMIT-REQUIRED CONFINED SPACES

NOTE: Appendices A through E serve to provide information and non-mandatory guidelines to assist employers and employees in complying with the appropriate requirements of this section.

Appendix A to 1910.146-PERMIT-REQUIRED CONFINED SPACE DECISION FLOW CHART

Appendix B to 1910.146-PROCEDURES FOR ATMOSPHERIC TESTING

Appendix C to 1910.146-EXAMPLES OF PERMIT-REQUIRED CONFINED SPACE PROGRAMS

Appendix D to 1910.146-SAMPLE PERMITS

Appendix E to 1910.146-SEWER SYSTEM ENTRY

Introduction.

If you are required to construct or work in a: Boiler, Cupola, Degreaser, Furnace, Pipeline, Pit. Pumping station, Reaction or Process vessel, Septic Tank, Sewage digester, Sewer, Silo, Storage Tank, Ship's hold, Utility Vault, Vat, or similar type enclosure, you are working in a **Confined Space.**

How can you identify a Confined Space? A confined space is a space which has any one of the following characteristics:

- limited openings for entry and exit
- unfavorable natural ventilation
- not designed for continuous worker occupancy

Limited openings for entry and exit: Confined space openings are limited primarily by size or location. Openings are usually small in size, perhaps as small as 18 inches in diameter, and are difficult to get needed equipment in or out of the spaces, especially protective equipment such as respirators necessary for entry into spaces with hazardous atmospheres or life saving equipment when rescue is needed. However, in some cases openings may be very large, for example open-topped spaces such as pits, degreasers, excavations, and ships' holds. Access to open-topped spaces may require the use of ladders, hoists, etc., and escape from such spaces may be difficult in emergency situations.

Unfavorable Natural Ventilation: Because air may not move in and out of confined spaces freely due to design, the atmosphere inside a confined space can be very different from the atmosphere outside. Deadly gasses may be trapped inside, particularly if the space is used to store or process chemicals or inorganic substances which may decompose. There may not be enough O2 inside the confined space to support life, or the air could be O2 enriched, increasing the chance of fire or explosion.

Not Designed for Continuous Worker Occupancy. Most confined space are not designed for workers to enter and work in them on a routine basis. They are designed to store a product, enclose materials and processes, or transport products and substances. Therefore, occasional employee entry for inspection, maintenance, repair, cleanup or similar task is often difficult and dangerous due to the chemical and physical hazards in the space.

A confined space found in the workplace may have a combination of these three characteristics, which can complicate working in and around these spaces as well as rescue operations during emergencies. If a survey of your workplace identifies one or more work spaces with the characteristics listed above, the following information may someday save your life, or the life of a co-worker.

Potential Effects of Oxygen Deficient Atmospheres.

Oxygen Content by Volume (% by Volume)	Effects and Symptoms (At Atmospheric Pressure)
19.5%	Minimum permissible oxygen level
15-19%	Decreased ability to work strenuously. May impair coordination and may induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12-14%	Respiration increases in exertion, pulse up, impaired coordination, perception and judgment.
10-12%	Respiration further increases in rate and depth, poor judgment, lips blue.
8-10%	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea, and vomiting.
6-8%	8 minutes, 100% fatal; 6 minutes, 50% fatal; 4-5 minutes, recovery with treatment.
4-6%	Coma in 40 seconds, convulsions, respiration ceases, death.

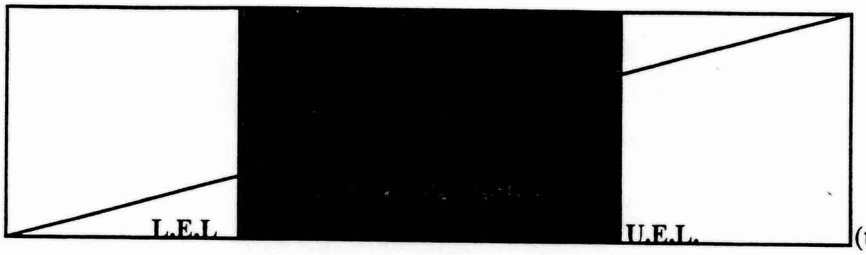
These values are approximate and vary as to the individual's state of health and his physical activities.

Exposure to atmospheres containing 12% or less oxygen can bring about unconsciousness without warning, and so quickly that e individual cannot help or protect himself.

Oxygen enrichment can also create a hazardous atmosphere in a confined space. Oxygen above the normal level of 21% increases the flammability range of combustible gases or material and causes them to burn violently. Do not purge confined spaces with oxygen in place of air. Improper blanking off of oxygen lines can produce oxygen enrichment.

All Combustible Cases and Vapors Have a Different Explosive Range

Lower Explosive Limit (LEL) vs. Upper Explosive Limit (UEL)

(too lean to burn) 

(too rich to burn)

The lowest concentration (air-fuel mixture) at which a gas can ignite is called its Lower Explosive Limit (LEL). Concentrations below this limit are too lean to burn.

The highest concentration that can be ignited is its Upper Explosive Limit (UEL). Above that concentration, the mixture is too rich to burn.

A gas is only combustible between its LEL and UEL, but any concentration of combustible gas should be a concern. Lean mixtures can collect in an area and reach a combustible level, or rich mixtures can be diluted with air to become combustible.

Instruments usually monitor for combustible gases below the LEL. A gas-air mixture becomes explosive at the LEL, but the monitoring range of most instruments (0-100% of the LEL) is below the limit to provide advanced warning. Alarm levels may be set at 10% if the LEL (a level considered Immediately Dangerous to Life and Health or IDLH) to forewarn workers of a potentially hazardous combustible atmosphere.

Carbon Monoxide.

Carbon monoxide is a colorless, odor-less gas that may build up in a confined space. In high concentrations of CO, a worker may collapse with little or no warning and thus be unable to aid himself.

Potential Effects of Carbon monoxide Exposure:

ppm	Effects and Symptoms	Time
35	Permissible Exposure Level	8 Hours
200	Slight Headache, Discomfort	3 Hours
400	Headache, Discomfort	2 Hours
600	Headache, Discomfort	1 Hour
1000-2000	Confusion, Headache, Nausea	2 Hours
1000-2000	Tendency to stagger	1½ Hours
1000-2000	Slight Palpations of the Heart	30 Minutes
2000-2500	Unconsciousness	30 Minutes
4000	Fatal	Less than 1 Hour

These values are approximate and vary as to the individual's state of health and physical activity.

Hydrogen Sulfide.

Although the foul odor (rotten eggs) of Hydrogen sulfide is easily detected at low concentrations, it is easily detected at low concentrations, it is an unreliable warning because the gas rapidly desensitizes the olfactory (sense of smell) nerves and leads to a false sense of security. In high concentrations of Hydrogen sulfide, a worker may collapse with little or no warning.

Potential Effects of Hydrogen sulfide Exposure:

ppm	Effects and symptoms	Time
10	Permissible Exposure Level	8 Hours
50-100	Mild Eye Irritation, Mild Respiratory Irritation	1 Hour
200-300	Marked Eye Irritation, Marked Respiratory Irritation	½ - 1 Hour
1000 or More	Unconsciousness, Death	Minutes

These values are approximate and vary as to the individual's state of health and physical activity.

BLOODBORNE PATHOGENS

Introduction

Concerns about AIDS can make slips and spills alarming if you're the first person on the scene of an accident. Yet AIDS isn't the only threat you face. In fact, you're more likely to be infected in the line of duty by the hepatitis B virus (HBV), which is just as deadly.

The Occupational Health and Safety Administration (OSHA) has issued a standard that, if followed, is designed to protect you. It details ways that can help you and your employer can work together to substantially reduce your risk of contracting a bloodborne diseases on the job. You are covered by the standard if it reasonably anticipated that you could be exposed to bloodborne pathogens as a result of performing your duties.

Bloodborne Diseases

Bloodborne diseases that you could be exposed on the job include non-A hepatitis, non-B hepatitis, hepatitis B, syphilis, malaria and Human Immunodeficiency Virus (HIV).

1. Viruses

A. Living or Non-living

Viruses, in general, are capable of causing great maladies in humans. But, where do they come from, how are they formed, and are they living. First of all, viruses have been around long before man walked the earth. They are tiny infectious agents capable of great destruction in the body but aren't really living. Viruses exist in that gray area between non-living and living organisms with some characteristics of both.
To be considered living, an organism must meet the following criteria:

1. **metabolism-** organism must need to eat use this food for energy
2. **growth-** organism must have growth in order to be considered living
3. **homeostasis-** organism must regulate it's own body temperature either through metabolism of fuel or by the environment of which they live in (i.e. a sponge living in the ocean)
4. **reproduction-** organism must be able to reproduce by itself or with like kind

Although viruses meet certain of these criteria, they do this with the aid of the host's body. A virus needs to become incorporated into the host cell to start the destructive cycle. It's there where the virus will lay dormant for a few hours up to many years before the virus starts it's cycle of activity. The viral genome now starts to influence the cell to replicate only those proteins which will contribute to the making of more viral particles. This can proceed rapidly causing so many virus particles to be produced that the cell ruptures causing cellular death. This is very pronounced in HIV patients where T-cell count can be reduced from 8000/cm3 in the blood of a healthy individual to less than 800/cm3 in that same individual classified with AIDS.

B. Make-up

The makeup of a virus is very simple in structure consisting of a segment of deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) surrounded by a protein coat capsid. This capsid surface is covered by antigen presenter molecules which in turn recognize some sequence on the host cell surface and thus binds to the cell. Once this happens, researchers believe that the host's immune system no longer recognizes the virus as being foreign or non-self. Now that the virus is bound to the cell, the viral genetic material is incorporated by the host cell and the cell's future is now doomed.

C. Size Comparisons

This is all taking place at the sub-microscopic level and unknown to the infected individual. The use of a electron microscope is the only way some viruses can be seen, with many having diameters of about 100 nanometers, or 0.1 micrometers. So if a thousand viruses were put into a line and a thousand of these lines next to each other making up a square of one million viruses, and then put a thousand of these squares on top of one another to make a cube of one thousand million viruses, this would be just visible to the naked eye. This dot would have the diameter of about one-tenth of a millimeter.

2. Methods of Transmission

Bloodborne pathogens may enter your body and infect you through variety of means including:

- An accidental injury with a sharp object contaminated with infectious material.
  Sharp objects include:
  √ Needles
  √ Broken glass
  √ Anything that can pierce, puncture, or cut your skin
- Open cuts, nicks and skin abrasions, even dermatitis and acne, as well as the mucous membranes of your mouth, eyes or nose.
- Indirect transmission, such as touching a contaminated object or surface and transferring the infectious material to your mouth, eyes, nose or open skin

A. Contaminated Surfaces

HBV can survive on surfaces dried at room temperatures for at least one week. Make sure that the area is thoroughly cleaned and disinfected.

B. Host to Host

Most transmissions of viruses are caused by contact with the infected host or contact with fluids from the infected host. These can range from blood to synovial fluid but all aren't equal in their infectious nature. By far, exposure to an infected individual's blood is the easiest way for transmission to occur and this must be limited as much as possible. There are many precautions which can be taken to limit exposure but blood isn't the only worry. Besides blood, there are other fluids which viruses have been enumerated in such fluids as saliva , cerebrospinal fluid, peritoneal fluid, synovial fluid, sperm and vaginal secretions (peritoneal fluid is found in the tissue surrounding the organs in the abdominal cavity).

C. Airborne

Some viruses have been transmitted to other individuals through the air. Although HIV and HBV aren't known to be transmittable in air, it can still be quite hard to convince fellow employees that they are at no risk in working near or in close contact with the infected individual. It is very important to explain the known ways these viruses can be transmitted so as to quell their fears.

D. Host's Waste

The last method of transmission is from the infected individual's waste. Contact with infected waste is of major concern in hospitals where this contact happens frequently. Engineering controls should be implemented and personal protective equipment must
be worn to protect these workers.

3. Attack on Victim's System

Although many types of viruses attack the numerous systems in the body such as influenza, which can cause the individual to have diarrhea, headache, runny nose, fever, chills and so on, some viruses only cause localized effects. For instance, HIV only really affects the immune system of the infected individual although the disease might enable other pathogens to affect other systems in the individual. Among the systems affected by bloodborne pathogens are respiratory, reproductive, immune, nervous, muscular, renal, and digestive. Some are so affected that they literally stop functioning all together as in hepatitis where the liver can stop all function.

4. Victim's Response

As the virus is affecting different systems in the body, there are many responses which the body initiates to try and fight these. Most are directed by the immune system and in particular the T-lymphocyte (T-cell). This cell is capable of directing other immune system responses such as swelling, fever, lymph gland swelling, and fatigue. Localized swelling is due to the movement of these immunologic factors leaving the bloodstream and invading the affected areas. Fever is initiated by the body to try and destroy viral or bacterial proteins. Most of the time these responses, along with medication, are enough to kill most bacterial infections but usually fall short in their attack on viruses. Many of which can lead to severe complications including death.

HBV

Hepatitis means "inflammation of the liver." Hepatitis B virus (HBV) is the major infectious bloodborne hazard you face on the job. It infects approximately 8,700 healthcare workers a year, resulting in more than 400 hospitalizations and 200 deaths. If you become infected with HBV:

- You may suffer flu-like symptoms becoming so severe that you require hospitalization.
- You may have no symptoms at all being totally unaware that you are infected.
- Your blood, saliva and other body fluids may be infectious.
- You may spread the virus to sexual partners, family members, and unborn infants.
- HBV may severely damage your liver, leading to cirrhosis and almost certain death.

HIV

The human immunodeficiency virus (HIV) attacks the body's immune system, causing the disease known as AIDS, or Acquired Immune Deficiency Syndrome. Currently, there is no vaccine to prevent infection. A person infected with HIV:

- May carry the virus without developing symptoms for several years
- Will eventually develop AIDS
- May suffer from flu-like symptoms, fever, diarrhea and fatigue
- May develop AIDS-related illnesses including neurological problems, cancer and other opportunistic infections.

HIV is transmitted primarily through sexual contact, but may also be transmitted through contact with blood and some body fluids. HIV is **not** transmitted by touching or working around people who carry the disease.

Workplace Transmission

In the workplace, bloodborne diseases are transmitted in the same ways. HBV, HIV and other pathogens may be present in:

- Body fluids such as saliva, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, and any other body fluids visibly contaminated with blood..
- Unfixed tissue or organs other than intact skin from living or dead humans.

Exposure Control Plan

The risks of bloodborne diseases in the workplace are quite serious. Yet you can learn ways of effectively minimizing them. A good place to start is with your employer's written Exposure Control Plan. A copy should be available for you to consult at your workplace during your shift. It will cover:

- Identification of the employees covered by the standard
- Specific measures you and your facility must take to minimize your risk of exposure
- Procedures to follow if there is an exposure incident

Universal Precautions

You may not be able to tell for sure which people carry bloodborne pathogens by taking a medical history of an examination. Both HIV and HBV infect people of all ages, of all economic classes, from every state and territory, and from rural areas as well as cities.

- Many people carry bloodborne infections and don't show any symptoms.
- Many infected people don't even know they are infected.

Reducing Your Risk

Five major tactics reduce your risk of exposure to bloodborne pathogens on the job:

1. Engineering controls
2. Employee work practices
3. Personal protective equipment
4. Housekeeping
5. Hepatitis B vaccine

1. Engineering Controls

Engineering controls are physical or mechanical systems your employer provides to eliminate hazards at their source. Their effectiveness usually depends on you.

Example: Specially marked bags for contaminated first aid materials provide no protection unless you remember to put all towels, gauze pads and other contaminated items into them.

2. Work Practice Controls

There are specific procedures you must follow on the job to reduce your exposure to bloodborne or infectious materials.

Handwashing

- If infectious material gets on your hands, the sooner you wash it off, the less chance you have of becoming infected.
- Handwashing keeps you from transferring contamination from your hands to the other areas of your body or other surfaces you may contact later.
- Every time you remove your gloves you must wash your hands with non-abrasive soap and running water as soon as possibly can.
- If skin or mucous membranes come in direct contact with blood, wash or flush with water as soon as possible.
- Where handwashing facilities are not available, such as an emergency medical van, your employer will provide an antiseptic hand cleanser or antiseptic towelettes. Use these as a temporary measure only. You must still wash your hands with soap and running water as soon as soon as you can.

Personal Hygiene

Additional self-protective controls should be followed to protect you:

- When performing procedures involving blood or potentially infectious materials, minimize splashing, spraying, splattering and generation of droplets.
- Do not eat, drink, or smoke, apply cosmetic or lip balms, or handle contact lenses where you may be exposed to blood or other potentially infectious materials.
- Avoid petroleum-based lubricants that may eat through latex gloves.
- Don't keep food and drinks in refrigerator, freezers, cabinets or on shelves, countertops or bench tops where blood or other potentially infectious materials may be present.

3. Personal Protective Equipment

Equipment that protects you from potentially infectious materials may include gloves, masks, gowns, protective eyewear, resuscitation bags or other ventilation devices.

Under normal work conditions, protective equipment must not allow potentially infectious materials to contact your work clothes, street clothes, undergarments, skin or mucous membranes. The type of protective equipment appropriate for a given task depends on the degree of exposure you anticipate.

Hazard: Generation of splashes, spray, spatter or droplets of infectious material.
Protection: Mask, gloves, eye protection or face shield.

Hazard: Potential clothing exposure or skin exposure.
Protection: Mask, gloves, eye protection, overalls and other protective clothing.

If your job requires you to be exposed to bloodborne pathogens, your employer will:

- Provide appropriate protective equipment at no cost to you.
- Clean, launder, repair, replace, or dispose of protective equipment at no cost to you.

General Rules on PPE

You and your employer must follow these rules to insure that your protective equipment does its jobs.

- You must be trained to use equipment properly.
- Protective equipment must be appropriate for the task.
- You must use appropriate protective equipment each time you perform a task.
- Your equipment must be free of physical flaws that could compromise safety.
- Your gloves must fit properly.
- If, when wearing equipment, it is penetrated by blood or other potentially infectious materials, remove it as soon as feasible.
- Before leaving the work area, remove all protective equipment and place in the designated area or container for washing, decontamination or disposal.

The Exception to the Rule

If you believe using protective equipment would prevent proper delivery of healthcare or jeopardize your safety or a co-workers, you may temporarily and briefly abandon its use in an emergency. After the incident, your employer must investigate the circumstances to determine if such a situation could be prevented in the future.

In all other circumstances, wearing appropriate personal protective equipment is your best option.

Resuscitation devices

Mechanical emergency respiratory devices and pocket masks are types of protective equipment designed to isolate you from contact with a victim's saliva during resuscitation. Avoid unprotected mouth-to-mouth resuscitation. The person may expel saliva, blood or other fluids during resuscitation.

Gloves

Gloves are the most widely used forms of personal protective equipment. They act as a primary barrier between your hands and bloodborne pathogens. Latex or vinyl gloves are used most frequently. Heavy duty utility gloves should be used for housekeeping duties.

How to use them:

- You must wear gloves when you anticipate hand contact with blood, potentially infectious materials, mucous membranes or non-intact skin.
- If you are allergic to latex or vinyl gloves, your employer will provide hypoallergenic gloves, glove liners, powderless gloves or another alternative.
- Since gloves can be torn or punctured by sharps, bandage any cuts before being gloved.
- Replace disposable single-use gloves, such as examination gloves, as soon as possible if contaminated, torn, punctured or damaged in any way. Never wash or decontaminate for reuse.
- Utility gloves may be decontaminated and reused unless they are cracked, peeling, torn, punctured, or no longer provide barrier protection.

Glove Removal

You must follow a safe procedure for glove removal, being careful that no pathogens from the soiled gloves contact your hands.

- With both hands gloved, peel one glove off from top to bottom and hold it in the gloved hand.
- With the exposed hand, peel the second glove from the inside, tucking the first glove inside the second.
- Dispose of the entire bundle promptly.
- Remove gloves when they become contaminated, damaged or before leaving the work area.
- Wash your hands thoroughly.

Good Housekeeping

Good housekeeping protects every worker- and it is every worker's responsibility. Your facility's Exposure Control Plan lists housekeeping staff:

- Clean and decontaminate at the end of each work shift.
- Clean all equipment and environmental working surfaces as soon as possible after contact with potentially infectious materials.
- Do not pick up broken glass which may be contaminated with gloved or bare hands. Use tongs or a brush and a dustpan.
- Place contaminated sharps and infectious wastes in designated sharp containers. The containers should be labeled or color-coded leak-proof of containers without sorting or rinsing.

Summary

It is possible to protect yourself from bloodborne pathogens on the job by knowing the facts and taking proper precautions. Working together with your employer, you can do it. As a first responder, you can be confident in your ability to care for safely for the well-being of others and yourself. There is a vaccine available for those employees who would like to receive it but will only be paid by the company if you are exposed to a fellow employee's blood. The vaccine is in a three shot series and quite painless.

References:

Merck Index
Lewis' Chemical Dictionary
ACGIH: TLV Guide
NIOSH: Pocket Guide to Chemical Hazards
Ansell Edmont: Chemical Resistance Guide
Permeation Guide for DuPont Tychem Fabrics
29 CFR *et seq.* OSHA Regulations
40 CFR *et seq.* USEPA Regulations
40 CFR 260 through 272 Resource Conservation Recovery Act (RCRA)
40 CFR 112 *et. seq.* Oil Pollution Prevention
40 CFR 300 *et. seq.* The National Contingency Plan
Toxic Substances Control Act (TSCA)
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
Safe Drinking Water Act
NY, NJ Area Contingency Plan

Environmental Acronyms:

API	--	American Petroleum Institute
BAT	--	best available technology economically achievable
BDAT	--	best demonstrated available technology
BLM	--	Bureau of Land Management
BOM	--	Bureau of Mines
BPT	--	best practicable control technology currently available
CERCLA	--	Comprehensive Environmental Response, Compensation, and Liability Act
CESQG	--	Conditionally Exempt Small Quantity Generator
CFR	--	Code of Federal Regulations
CMA	--	Chemical Manufacturers Association
CWA	--	Clean Water Act
DOI	--	U.S. Department of the Interior
EPA	--	U.S. Environmental Protection Agency
EPRI	--	Electric Power Research Institute
F&WS	--	U.S. Fish and Wildlife Service
HSWA	--	Hazardous and Solid Waste Amendments
MSW	--	municipal solid waste
NAAQS	--	National Ambient Air Quality Standards
NEPA	--	National Environmental Policy Act
NESHAP	--	National Emission Standard for Hazardous Air Pollutants
NORM	--	naturally occurring radioactive material
NPDES	--	National Pollutant Discharge Elimination System
NPL	--	National Priorities List
OSHA	--	Occupational Safety and Health Administration
PCB	--	polychlorinated biphenyl
POTW	--	publicly owned treatment work
RCRA	--	Resource Conservation and Recovery Act
SARA	--	Superfund Amendments and Reauthorization Act
SDWA	--	Safe Drinking Water Act
SIC	--	Standard Industrial Classification
TRI	--	Toxics Release Inventory
TSCA	--	Toxic Substances Control Act
VOC	--	volatile organic compound

HAZWOPER Final Exam

Print Name:	*Date:*
Sign Name:	*Company Name:*

1) Assistance in selection of respiratory protection for a given chemical can be found in what *industry provided* document?

_____

2) RCRA stands for _____ _____ and _____

_____, and it was first enacted in what year? _____.

3) The UEL is the maximum concentration of _____ in _____that

will produce an explosion if a(n) _____source is added.

4) IDLH stands for: _____

Circle T for True and F for False for questions 5 through 11.

5) The proper APR filter for ammonia is green in color. **T F**

6) A site safety plan is required for all emergency responses. **T F**

7) Your nose will be able to detect when the concentration of CO in a tank is above the PEL. **T F**

8) Heat rash is more dangerous than heat stroke. **T F**

9) Chronic toxicity usually occurs from a single, high dose exposure to a chemical. **T F**

10) Water in copious amounts is the only way to bring concentrated NaOH to a neutral pH. **T F**

11) Site controls are always needed when responding to a release of hazardous material. **T F**

12) PEL stands for:

a) Potential Explosion Level

b) Permissible Exposure Limit

c) Past Experience in Law

d) Pre-Entry List

13) Are people with no OSHA training allowed to enter the warm or hot zones?

a) yes

b) no

c) sometimes

d) only when their job depends on it

For the questions 14 through 18, please indicate what zone the indicated activities take place by writing the appropriate letter next to the activity:

A) Hot Zone
B) Warm Zone
C) Cold Zone
D) Twilight Zone

14) _____ Clean up and containment activities.

15) _____ Decontamination of personnel and equipment

16) _____ Support functions like medical monitoring of workers and liquid refreshment area.

17) _____ Zone where MSDSs, Site Safety Plan and emergency phone numbers are located.

18) _____ Zone where strange things happen to average people for unknown reasons and in black and white.

19) Below or on the back of this page, draw a picture of a leaking 55 gallon drum of a hazardous material you have in your workplace.

20) Identify (label) the following in your drawing:

a. the drum
b. the spill area (the contaminated soil or ground)
c. the hot zone
d. the cold zone
e. the warm zone
f. the decontamination area
g. the incident commander
h. the lunch area
i. the hazardous waste drum
j. the HAZMAT Technicians doing the cleanup
k. the back up team for "j."

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PERSONNEL TRAINING FOR HAZARDOUS WASTE MANAGEMENT

This training program has been designed to ensure that all personnel involved with hazardous waste management and emergency response will be able to perform their duties without causing harm to human health or the environment. The program was designed in compliance with the applicable federal (40 CFR 265.1-6) and the applicable state requirements.

Job titles and specific written job descriptions are kept on file. Employees receive initial training when hired, and continuing training on an annual basis. Training records are kept on file, and are available for review.

This particular training program has been divided into separate modules for convenience. Each employee is trained in every module applicable to his/her job requirements.

PERSONNEL TRAINING FOR HAZARDOUS WASTE MANAGEMENT

CHEMICAL HANDLING

This section provides training for those individuals who are responsible for handling hazardous waste, from the point of generation to the point of disposal. Employees are informed of chemical characteristics, compatibility, precautionary measures for handling various chemicals, and sources of vital chemical information.

Hazards and precautions associated with chemical handling are presented in several forms. A chemical handling manual, prepared by the company, addresses properties associated with the chemicals used at Konica, and the precautions that should be taken when working with each type.

In addition, a video on hazardous chemical safety is shown to all individuals. This video explains the basics involved with safe handling of chemicals. Other videos and overheads are also shown on a variety of topics: hazardous chemical storage, hazardous chemical handling and labeling, toxic substances, corrosives, flammable solvents, compressed and cryogenic gases, and on hazard communication. On-the-job training is used to supplement these formal sessions. In many cases, specific instructions (verbal and written) are given to employees prior to having them perform certain duties. These instructions are specific for the hazards and precautions associated with the particular job or chemicals involved.

Material safety data sheets for all raw materials and final products are made available to all employees. Located in many areas throughout the facility, these data sheets contain important information on each substance. The use of these data sheets is explained and encouraged by supervisory personnel, the Environmental & Safety Department to all affected employees.

PERSONAL PROTECTIVE EQUIPMENT

Training in this area is provided for each individual who will handle chemicals/hazardous wastes. Training in the use of personal protective equipment (PPE), from safety showers to respirators to ear protection, is catered somewhat between individuals, depending on which equipment will most often be utilized. The same holds true for protective clothing.

In order to ensure timely use of safety equipment, new employees are issued appropriate safety equipment/clothing on their first day. Proper use of all equipment is explained by safety personnel when issuing the equipment or by the supervisor. Replacement or additional equipment is available through the Environmental & Safety Department.

Safety shoes are issued to all production employees. Company policy, which mandates the use of safety shoes in designated areas, is enforced by individual supervisors. Various types of eye protection (safety glasses, goggles, face shields) are made available to all employees as per a hazard assessment. In addition, eve wash stations are located throughout the facility.

Nuisance dust/fume masks are available for all employees requesting them. The issuance of a respirator is based on a hazard assessment. The importance of using a respiratory with the proper design and fit is stressed by safety personnel, in videos, and by posters describing the functions of different respirators. Self-contained breathing apparatuses are also available. Emergency personnel are trained and practice in using the SCBA.

Ear protection is available for all employees. In areas which test high for noise, ear protection is mandated. A video on hearing is shown to affected employees, and are provided with audiograms and annual training.

Protective clothing is also available to employees. Rubber gloves, aprons, boots, and Tyvek suits are all available. In certain areas, the use of special clothing is mandatory. In these areas, employees are trained on-the-job by their supervisors as to the type of protection needed, its proper fit and use, and the importance of timely replacement.

The locations of the nearest safety showers and eye wash stations are shown to all employees. The importance of their use in case of accident is explained in the video on chemical handling. This equipment is inspected and activated weekly by each department.

PERSONNEL TRAINING FOR HAZARDOUS WASTE MANAGEMENT

EMERGENCY PROCEDURES

All employees are trained in the proper use of fire extinguishers during their orientation and annually thereafter. Fire extinguishers and fire hoses are located throughout the facility for use in case of emergency. Security personnel are responsible for visually inspecting the extinguishers monthly and weighing, recharging and having hydrostatic tests performed as necessary. Our fire sprinkler system is checked bimonthly by a supervisory company and annually by our insurance carrier. In addition, the insurance carrier conducts an annual pump test.

Konica maintains an emergency evacuation plan covering fires, bomb threats, chemical and hazardous wastes spills and other emergencies which may call for evacuation. This document outlines step-by-step actions for dealing with these emergencies at all times. Persons who should be notified are listed in order of priority. The local police and fire departments have been issued the lists of chemicals used and their locations in case of such emergency(-ies). The switchboard operators, security guards, and emergency response personnel are issued updated versions of this document periodically to ensure that all necessary personnel will be prepared to act in an emergency. The evacuation alarm is tested monthly by security personnel.

Spill response training is provided for those individuals who are responsible for organizing, directing, and cleaning all hazardous waste spills, such as EPA, safety, and security personnel. Each of these individuals receives training in chemical handling, personal safety equipment, and emergency response equipment as necessary for their job performance. Spill response personnel are familiar with our spill prevention countermeasure and control plan and our spill response supplement. These documents, on file at several places, are designed to instruct personnel as to the proper procedures of spill control, based on the nature of the hazardous material or wastes involved. The procedures outline all aspects of spill response - from the initial discovery of the spill to the final disposal of all wastes and materials used in the clean-up. A pager/phone list is on file, so that the spill team can be contacted, regardless of the time which the spill is reported. This list includes office and home phone numbers, and addresses of spill team members. Another list provides the phone numbers of the national response center, local authorities, and other government agencies.

PERSONNEL TRAINING FOR HAZARDOUS WASTE MANAGEMENT

DRUM HANDLING

All personnel responsible for handling hazardous waste contained in drums or other containers are shown proper drum handling techniques. Employees are shown proper techniques for removing, adding, and transferring materials to or from such containers. Instructions on compatibility and personal protective equipment are explained elsewhere. Presentations on proper lifting techniques are shown to employees who may have to transfer smaller containers into drums, to help avoid injuries.

Drum inspection, sealing, moving, and palletizing are also addressed. A video on drum handling is used in addition to on-the-job training. Forklift operators, who transport hazardous waste drums, are given forklift training prior to forklift operation.

PERSONNEL TRAINING FOR HAZARDOUS WASTE MANAGEMENT

WASTE LABELING AND STORAGE

This training is directed at personnel who are responsible for the proper labeling and storage of hazardous waste beyond the initial generation. Individuals who are responsible for accumulation areas and those working in the wastewater treatment plant are targeted for this training. Instruction on segregation of incompatible wastes, proper palletizing of drums, and proper sealing of drums are described in detail elsewhere.

Individuals are given written summaries of proper labeling and storage in accumulation areas. Weekly inspections of these areas guarantees compliance. Once moved into the main bermed storage areas, trained personnel label all wastes as necessary for disposal. This labeling training is done in videos and on-the-job. Almost-daily inspections are used to ensure compliance. Written documents showing proper DOT shipping names, hazard classes, and EPA waste codes are used for guidance. Emergency personnel are trained to consult these labels for information in case of leaks or other emergencies.

Prior to disposal of any waste, the contents of the drums are compared with their labels to make certain that no mistakes were made.

Copies of the regulations governing the manifest of hazardous wastes have been forwarded to all individuals authorized to sign the documents.

PERSONNEL TRAINING FOR HAZARDOUS WASTE MANAGEMENT

RECORD KEEPING

All records regarding waste transfers and disposals, both hazardous and nonhazardous are kept by the Environmental & Safety Department. All wastes for temporary storage or disposal, are logged-in and dated. The name of the waste, the amount, its storage position, and its ultimate disposal are kept on record.

Non-hazardous wastes which are disposed are also indicated.

All hazardous and nonhazardous wastes are sent off-site for disposal, are documented by use of manifests which are retained in the Environmental & Safety Department office. Training for this record keeping is done on-the-job.

Certificate Number: 1099

C2T
The Technical Compliance Center
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Voice: (516) 391-9271 • Fax: (516) 391-9274 • eMail: OSHAMD@aol.com

Certificate of Completion

Let it be known, on February 6, 1999

Charles Tozzo

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

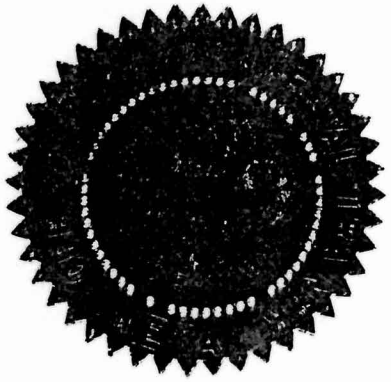
Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally
Gwen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1100

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The Technical Compliance Center
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Certificate of Completion

Let it be known, on February 6, 1999

Daniel Romeo

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

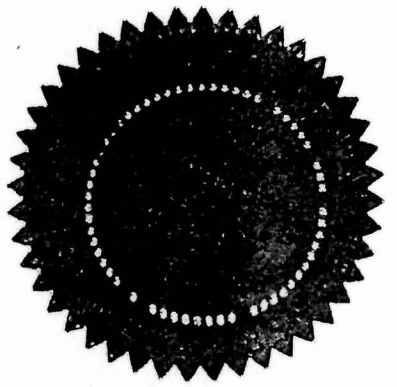
Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally
Gwen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training



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Certificate of Completion

Let it be known, on February 6, 1999

Anthony Randazzo

Successfully completed 8 hours of
HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;
including Awareness training in
Bloodborne Pathogens (29CFR1910.1030)
Permit Required Confined Spaces (29CFR1910.146)
PPE Level: B, C and D

Owen McNally
Owen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training

Certificate Number: 1106

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Certificate of Completion

Let it be known, on February 6, 1999

Wayne Frey

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

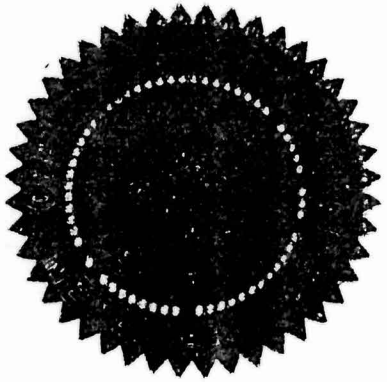
Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally
Gwen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1107

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Certificate of Completion

Let it be known, on February 6, 1999

Peter Helmus

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

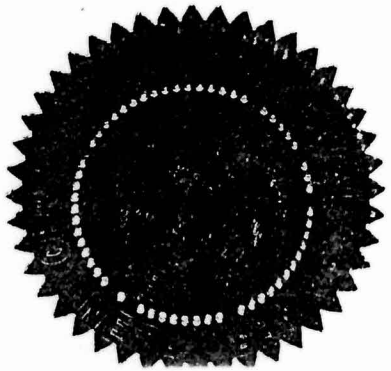
Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally
Gwen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1103

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Certificate of Completion

Let it be known, on February 6, 1999

Gabriel Alarcon

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

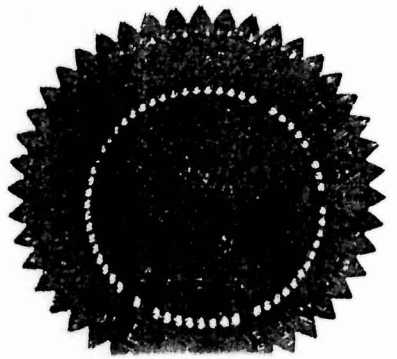
PPE Level: B, C and D

Gwen McNally

Gwen McNally
Instructor

S. Joseph Pampinella

S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1101

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Certificate of Completion

Let it be known, on February 6, 1999

Darren Pittman

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

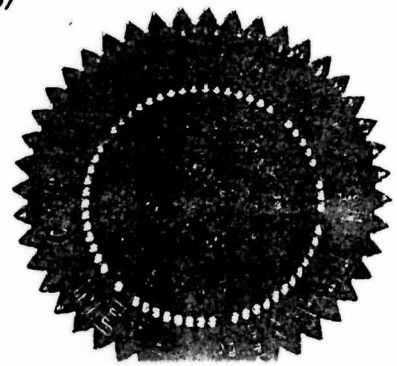
Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally
Gwen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1105

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Certificate of Completion

Let it be known, on February 6, 1999

Mike Kino

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

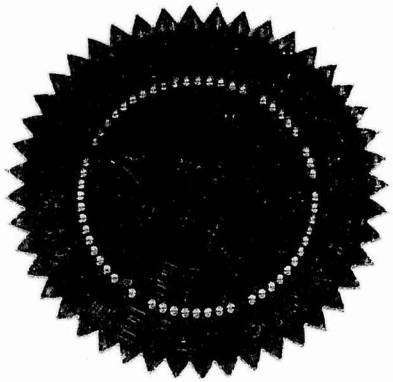
Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally
Instructor

S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1102

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The Technical Compliance Center
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Certificate of Completion

Let it be known, on February 6, 1999

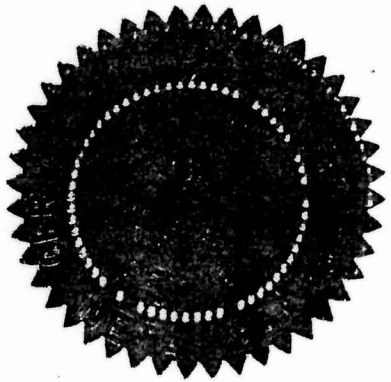
Jim McLoughlin

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;
including Awareness training in
Bloodborne Pathogens (29CFR1910.1030)
Permit Required Confined Spaces (29CFR1910.146)
PPE Level: B, C and D

Gwen McNally
Gwen McNally
Instructor

S. Joseph Pampinella
S. Joseph Pampinella, CET
Director of Training



Certificate Number: 1104

C2T

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Certificate of Completion

Let it be known, on February 6, 1999

Alan Wachtin

Successfully completed 8 hours of

HAZWOPER refresher training under OSHA regulation 29 CFR 1910.120;

including Awareness training in

Bloodborne Pathogens (29CFR1910.1030)

Permit Required Confined Spaces (29CFR1910.146)

PPE Level: B, C and D

Gwen McNally

Gwen McNally
Instructor

S. Joseph Pampinella

S. Joseph Pampinella, CET
Director of Training